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## MODERN TARIFF SYSTEMS.

"Modern Tariff Systems" is the title of a monograph just issued by the treasury bureau of statistics. It presents in concise form a statement of the three distinct tariff systems now applied in the principal commercial countries of the world, and is of especial interest at this time in view of the tariff discussions and pending tariff legislation in certain European countries. The tariff systems now in use among the prominent commercial countries of the world may be classed under three heads: (1) The general tariff system; (2) the general and conventional tariff system; and (3) the maximum and minimum tariff system. The system of a general tariff is the simplest of those enumerated, and consists in having a single schedule of import duties, which is applied to the goods of all countries without distinction. Such a tariff is altogether an act of the legislative branch of the government. It takes account only of the needs of the home country, and recognizes foreign commercial relations only in so far as the latter are in harmony with home interests.

The system of general and conventional tariffs, however, makes a distinction between goods which come from different countries. The fact that nations which make use of a general tariff often find themselves compelled to change this tariff when they later make commercial treaties is evidence of how difficult it is to maintain such a tariff intact. But since modern nations are practically compelled to have more or less commercial relations with each other, some way of regulating these relations must be found, and the usual method of securing this end is by means of a mutual understanding between the countries in question. Generally one nation declares itself ready to grant some concession or reduction in its tariff if a corresponding concession is offered in return. If an agreement is reached, a treaty is then made, and as a rule the willingness is expressed to make further treaties with other countries under similar conditions. Such a treaty will usually introduce new tariff rates. If the state substitutes these rates for those in the general tariff, then no change in the system takes place. The usual course, however, is for the state to now maintain two columns in its tariff schedule; the first for those countries enjoying the "most-favored-nation" treatment, which is called the treaty or conventional tariff, and the second containing the original rates, for those countries not receiving this treatment, and termed the general tariff.

The rates of the conventional tariff are, of course, never higher than those of the general schedule, and are usually lower. It may be, however, that one nation regards it of importance that a certain rate, a reduction of which is refused by the other power, should not be increased during the period for which the treaty is made. The making of an agreement that rates shall not be changed is termed "binding" such rates. That is, the conventional tariff schedule is composed of reduced and "bound," or fixed rates. The general schedule may be changed at any time without breaking any of the conditions of the treaty, but, the conventional schedule can only be changed by the consent of both parties.

The general tariff is framed with the acknowledged purpose of being the basis for the negotiations of commercial treaties. A conventional schedule is drawn up in these treaties, and, by the action of the most favored nation clause, the conventional tariff becomes so extended in application that, as a rule, it is the exception to apply the general tariff. For this reason, the general tariff is regarded mainly in the light of a preliminary sketch of the real tariff. As a consequence, the rates in the general schedule are not infrequently made rather high, so that they can readily be reduced and concessions demanded in return. There is always the possibility, however, that the negotiations may be broken off for some unforseen reason, and the undesired high rates become actual rates. This possibility generally exerts a restraining influence in the framing of the general tariff. The course which events in the field of commercial policy may take will always exert considerable influence in the formation of such tariff schedules, but the main consideration must always be the needs of the home producers.

The most prominent country using the general and conventional system is Germany. The general tariff is practically that of 1879 with the later amendments. The conventional tariff is made up of the schedules contained in the commercial treaties with Austria, Italy, Belgium, Switzerland, Russia, Roumania, Greece and Servia. Partially through commercial treaties and partially through the action of the administration in making most-favored-nation agreements, Germany has extended the application of the conventional schedule until it is now given to all European countries except Portugal. The general tariff, therefore, has only a very limited scope, and in this case may be regarded as a penalty tariff. In Austria the general tariff is based on the laws of 1882 and 1887.

The maximum and minimum tariff system is distinguished from the above system, first of all, in its form. Instead of having two rates for a few articles it has two rates on most articles on which duties are imposed, and for this reason is frequently called the double tariff system. In the application of these rates the maximum schedule corresponds to the general schedule and the minimum schedule to the conventional schedule of the system just described, since the minimum rates are given only to those countries which receive the most-favored-nation treatment. The characteristic difference between the two systems, however, arises from the difference in their origin. The minimum schedule is not drawn up by negotiations between the executives of the two countries, but is framed by the legislative body at the same time that the maximum schedule is made. That is, the legislative power fixes two rates of duty on each article in the tariff. The higher rate is the one which fixes the maximum extent to which those articles may be taxed on entering the country; the lower, or minimum rate, is the one which fixes the minimum extent to which the duty may be lowered. If it is desired to make commerial treaties at any time, these two rates show the exact limits between which the treaty rates are to be fixed.

The countries at present using a multiple or maximum and minimum tariff system are Spain, France, Russia, Brazil, Greece and Norway

## LAKE SEASON COUNTS FOR A YEAR.

Newspapers around the lakes have lately referred to the case of Walter G. Stewart, who was some time ago refused a license by the local inspectors of steam vessels at Marquette, but who was afterwards granted a license for the reason that the decision of the local inspectors was overruled by the treasury department. The facts in the case have not been properly stated. The whole matter is very clearly put forth in the decision of the treasury department, which is dated June 4, 1889, signed by Acting Secretary Geo. S. Batcheller and addressed to Wm. M. Daly, who was at that time supervising inspector at Detroit. The decision is as follows:

"Complaint has been made to the supervising inspector-general that the local inspectors at Marquette, Mich., have rejected the application for pilot's license of Walter G. Stewart, for lack of the three years' experience required under section 12 of rule 5, rules and regulations. An examination of this case reveals the fact that Mr. Stewart, the applicant referred to, has served three full seasons of navigation as wheelsman on steam vessels, and one full season as a sailor on sail vessels; but, as the season of navigation on the lakes is but about eight months, and the actual service of Mr. Stewart is only thirty-one months and a half, the inspectors decide that he has not served the full term of thirty-six months (or three years) required by the rule. The rule referred to reads as follows: 'No original license for any route shall be issued to any person, except for special license on small pleasure steamers and ferry boats navigating outside of ports of entry and delivery, who has not been employed in the deck department of a steamer or sail vessel for the term of at least three years preceding the application for license.' The department, after a careful consideration of the subject, has come to the conclusion that the inspectors at Marquette have erred in their construction of the rule under consideration; which rule should be interpreted as requiring an applicant for pilot's license to have served continuously during the full season of navigation on the waters upon which he has been employed during three calendar years only, and not thirty-six months of actual employment, which on the lakes would require an actual term of four and a half years of preliminary employment, instead of three years, as the department believes the rule intended. You will, therefore, instruct the local inspectors at Marquette that if Mr. Stewart has the legal qualifications required of pilots by section 4442, revised statutes of the United States, that the department decides that the experience of Mr. Stewart, as shown in his application, complies with the technical requirements of section 12 of rule 5, and they (the inspectors) should issue the license."

## LAKE FREIGHT MATTERS.

Although lake vessel owners were finally defeated in their effort to make the contract ore rate from the head of Lake Superior 80 instead of 75 cents, they are taking some consolation from the difficulties that have attended an early opening of navigation. The strike of harbor tugmen, coupled with considerable unfavorable weather just after the vessels began moving, has delayed matters so that the greater part of the month of April will have passed before the lake fleet is entirely under way. Still, some iron ore has already been delivered at Ohio ports and with the ice barrier removed from Buffalo harbor the opening of navigation is the earliest in a great many years past. This early opening is what the vessel owners have feared most, as the large amount of new vessel capacity coming from the ship yards must necessarily have a marked effect on freights in a long season, especially if there is any improvement over last year in the despatch given to vessels at the ore docks. But the number of vessels taking chances on trip-to-trip freights is nevertheless much larger than in previous years. Owners of these vessels say that too much importance is attached to the matter of surplus tonnage in view of the great volume of business in sight. They find most satisfaction in reports from iron and steel trade centers, showing that large orders are being booked daily for delivery extending into 1903. A most significant item of this kind is the purchase by the United States Steel Corporation of 225,000 tons of Bessemer pig iron for delivery between Oct. 1, 1902, and April 1, 1903. This takes up for the period noted half the capacity of merchant furnaces producing Bessemer iron. The Steel Corporation is said to be in the market for foreign iron, but with the English market advancing also, home iron will probably be taken, even at the present high prices, in preference to importations.

Quite a large amount of soft coal to go to the head of Lake Superior has been covered by lake freight contracts at 35 cents.

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A dispatch from Ottawa says that the Montreal, Ottawa & Georgian Bay Canal Co.'s bill has been reported favorably by the senate railway committee. The bill extends the time of completion to 1910, and was explained by Mr. Wisner, the company's engineer. He said that the cost of a 20-ft. canal would be $80,000,000. Only 45 miles would require canaling out of the 495 miles. Mr. Wisner thought the canal could be operated during eight months of the year.

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Mr. J. Pierpont Morgan sailed for England on the Oceanic last week. Mr. Morgan evaded all questions as to his plans abroad and said he did not know how long he would be away. When asked if the report that he was to make his home permanently in England was true he replied: "I have always had a home in England. That is all I care to say on the subject." He added that he would attend the coronation of King Edward VII.

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A London dispatch says that submarine boat No. 1, built upon the Holland design by Vickers Sons & Maxim, Barrow, has had her trial. With seven persons inside the boat was successfully submerged, maintaining an even keel and a straight course throughout.

## FRENCH SHIPPING BOUNTY.

Both the French senate and the chamber of deputies have now passed the bill to subsidize the French merchant marine. The tonnage admitted to the benefit of the law, over and above that of the sailing vessels already on the register before its promulgation, is 500,000 tons gross for steamers and 100,000 tons gross for sailing vessels. But the maximum total of sailing tonnage, laid down after Jan. 1, 1902, admitted to the benefit of the new law, is limited to 45,000 tons gross. French vessels will be reputed to have lost their nationality if they are docked or repaired abroad at a cost exceeding 15 francs per ton of the total gross measurement. The total amount payable as "compensation" and "navigation bounty" under the law is limited to 150,000,000 francs, of which not more than 15,000,000 francs shall be payable to sailing ships. The total amount payable as construction bounty is limited to 50,000,000 francs, and the amount of new tonnage to claim this bounty in any one year is limited to 50,000 tons for steamers and 15,000 tons for sailing vessels. The following are the principal features of the new law:

A "compensation" is payable to iron and steel steamers built abroad measuring more than 100 tons gross, put on the register during the period covered by the law, and belonging to Frenchmen, at per day of active employment in the oversea or international coasting trades and per ton of the total gross measurement, on the following scale:

5 centimes (fr. 0.05) per ton up to 2,000 tons.
4 centimes (fr. 0.04 ) for every additional ton up to 3,000 tons.
3 centimes (fr. 0.03) for every additional ton up to 4,000 tons.
2 centimes (fr. 0.02) for every additional ton.

The number of days in any one year for which the "compensation" can be claimed is limited to 300. Steamers of over 7,000 tons will only take the same allowance as 7,000-ton boats.

A "navigation bounty" is payable for every vessel employed in the oversea trade and built in France, measuring more than 100 tons gross, for the period of twelve years, dating from the registration of the ship, and navigating under the French flag, at per 1,000 miles run, and per ton of the total gross measurement, on the following scale:

For steamers.—1 fr. 70 centimes (fr. 1.70) for the first year, with annual decreases, dating from their registration, of 4 centimes during the first four years, of 8 centimes during the second period of four years, and of 16 centimes during the third period of four years.

For steamers measuring more than 3,000 tons gross, however, the tariff of the bounty will be reduced by one centime per 100 tons or fraction of 100 tons above 3,000 tons, but the tariff for the first year must not, nevertheless, descend below 1 fr. 50 c. up to 7,000 tons. The bounty for steamers of over 7,000 tons will be that to which steamers of 7,000 tons would be entitled.

For Sailing Vessels.—1 fr. 70 centimes (fr. 1.70) for the first year, with annual decreases, dating from their registration, of 2 centimes during the first period of four years, of 4 centimes during the second period of four years, and of 8 centimes during the third period of four years.

For sailers measuring more than 600 tons gross, however, the tariff of the bounty will be reduced by 10 centimes per 100 tons or fraction of 100 tons above 600 tons up to 1,000 tons. The bounty for sailers of over 1,000 tons will be that to which a ship of 1,000 tons would be entitled.

A "construction bounty" is payable to French builders of both steamers and sailers, ostensibly with the object of compensating them for the customs duties levied on foreign materials, on the following scale. But the amount of tonnage taking this bounty in any one year is limited to 50,000 registered tons for steamers and 15,000 for sailers:

For iron or steel vessels ..... 65 fcs. per ton gross.
For wooden ditto of 150 tons and over.... 40 fcs. per ton gross.
For wooden ditto of less than 150 tons.... 30 fcs. per ton gross.
For engines and boilers ..... 15 fcs. per 100 kilos.

Five per cent. of the amount payable for "compensation" or "bounty" will be deducted for the benefit of French seamen, and 6 per cent. for the seamen's pension fund. Vessels in the international coasting trade will only receive two-thirds of the "bounty" and "compensation" money. Owners of French-built steamers may, for each voyage, at their option, claim either the "compensation" or the "navigation bounty," but they cannot claim both. For steamers not having realized a speed of 12 knots at their trial when half-laden a reduction of 5 per cent. in the navigation bounty or compensation will be made, and if the speed so realized is less than 11 knots the reduction will be 10 per cent. Steamers not having realized a minimum speed of 10 knots at their trial when half-laden, and vessels acquired from abroad and mortgaged at the time or within six months afterwards for more than half their value, or which become French property after they are seven years old, are excluded from any benefit under the law.

## PROPOSED RUSSIAN BOUNTY FOR SHIP BUILDING.

An important announcement is made by the Mouvement Maritime. It is to the effect that in the course of the labors of the Kharkoff congress, just held at the initiative of the Russian minister of marine for the purpose of considering what measures ought to be taken to widen the markets for Russian metallurgical products, resolutions were passed in favor of granting bounties for ship building. These resolutions were submitted to the government with the result that, under the direct auspices of the Grand Duke Alexander, a bill has been drawn up, of which the following are the principal features: (1) The government to advance to the ship owner, by way of loan, 50 per cent. of the price of a vessel built in Russia, the loan to be paid off in twenty years without interest; (2) government to insure the vessel for three-fourths of her value at the rate of 2 per cent. per annum, and the saving under this head for the period of twenty years would, so to say, suffice to pay off the loan; (3) government to pay half the price of the coal consumed by the ship owner, on a scale to be agreed upon, on condition that Russian coal is used; (4) the law to apply, for a period of twenty years, to all vessels built in Russia, with Russian materials, within ten years after the promulgation of the law; (5) the Russian minister of finance reserves to himself the right, ten years after the passing of this law, to confer the privileges of the Russian flag only upon vessels constructed exclusively in Russia. It is stated that the provisions of this bill, or some of them, have aroused an energetic opposition on the part of ship owners who have been accustomed to supply themselves from abroad; nevertheless it is thought quite likely that the measure will be adopted by the council of the empire.

## POLITICS DEFEATED NEW YORK STATE CANAL BILL.

Buffalo, April 9.—The state newspapers are very silent over the canal situation, most of them, so far as noted, hardly going further than to report that the bill, after going through one house of the legislature, was not taken up in the other, a different bill on the same subject having failed there. In most cases there appears to be a special reason for this silence. The friends of the measure are genuinely sorry that it failed, but they are all aware that it is party politics alone that is responsible for the killing of the bill in the assembly. Everybody knows that Gov. Odell could have sent it through with a word had he chosen to do so, as the legislature was entirely under his control. Absolutely no measures went contrary to his wishes during the session. So he is alone responsible for the situation. Of course his political friends are keeping still just now, whether they favor the canal or not, and as to the opposition it seems to be accepted that there is a sort of still hunt on that is likely to develop into something racy before the fall campaign is well under way. For Gov. Odell is to come up for re-election this fall and the opposition is "laying" for him with a big canal plank to hit him with. He was anxious not to have a canal appropriation to vote on in a governor election, as it would complicate matters a good deal and would be sure to hurt him in the rural districts, from which most of his support must come.

So the canal had to wait. But the opposition is accused of a still worse sort of conduct. The leaders of it are said to be pleased with the outcome. They wanted to see the bill killed while at the same time they and their followers voted for it. While they did not succeed to the letter in this, there is to be all possible use made of the fact that they favored the bill and that the other party killed it. Then an added plea is to be set up that their party has always been the canal party of the state and is ready to continue in that policy, while the other party never did anything for it. This is the way friends of the canal see the situation. They rather look for the Odell party to fall into line this fall and put a good strong canal plank into their platform, for if they do not the opposition will be quite likely to make it a leading issue and nominate an entire state ticket on it. As there are no local or national issues to come up this fall—New York electing state and local officers in alternate years—the canal may easily be the sole issue.

Coming back to the genuine friends of the canal, who are urging its claims on purely business lines, there is anything but despondence over the defeat at Albany. They say that there is far more canal sentiment throughout the state than there ever was before. They are sorry that the fight must be made again, for it costs money, but they are going to make it all the same. They have found that the demand of the iron industry for the canal is one that cannot be met by any sort of argument, and New York is soon to be dominated direct by iron manufactures, as indicated by the great plant approaching completion in Buffalo and the big jump into prosperity of the iron districts of Ohio and Pennsylvania which is to be emulated soon at home. So nobody cares to deny this industry any aids that it can furnish. Hence the growth of canal sentiment, especially in canal counties, which see auxiliary furnaces lining the canal in the not distant future all the way to New York.

Gov. Odell and his party have for some time held control of the state, in spite of the fact that the opposition claim the most votes and to have lost through lack of a rallying point, hence its leaning towards a canal campaign. While the real friends of the canal would prefer to see it restored on business lines, they are not going to reject support to it, let it come whence it may. There will be a very careful watch put on each other by the great parties, each with the other eye on the canal, and a still more careful watch kept on both by good canal men, with both eyes on the canal the same time. JOHN CHAMBERLIN.

## FALLING OFF IN SHIP BUILDING ABROAD.

The ship building industry abroad has evidently fallen off considerably as the following brief comment in Fairplay of London will show:

"Although few ship building orders are reported ship builders are receiving a large number of inquiries for new tonnage. The Toyo Kisen Kaisha will, it is expected, shortly place orders for two large Pacific liners, probably on the northeast coast; the P. & O. Co. is, it is rumored, about to contract with Belfast builders for the construction of two large steamers; and the General Steam Navigation Co., the Royal Mail Steam Packet Co., Messrs. Elder, Dempster & Co., and others will, it is believed, be shortly placing orders for new tonnage. Orders recently given out have been at prices which show a marked fall on those current a year or so ago, a vessel of about 6,000 tons deadweight capacity having been placed at about £6 2s. per ton as compared with about £8 twelve or eighteen months ago. A tender recently sent in for a steamer of between 9,000 and 10,000 tons deadweight, for the Atlantic cargo trade, was about 25 per cent. lower than the price paid for a similar vessel built eighteen months ago. It is believed that the placing of the admiralty contracts will have the effect of somewhat hardening the market."

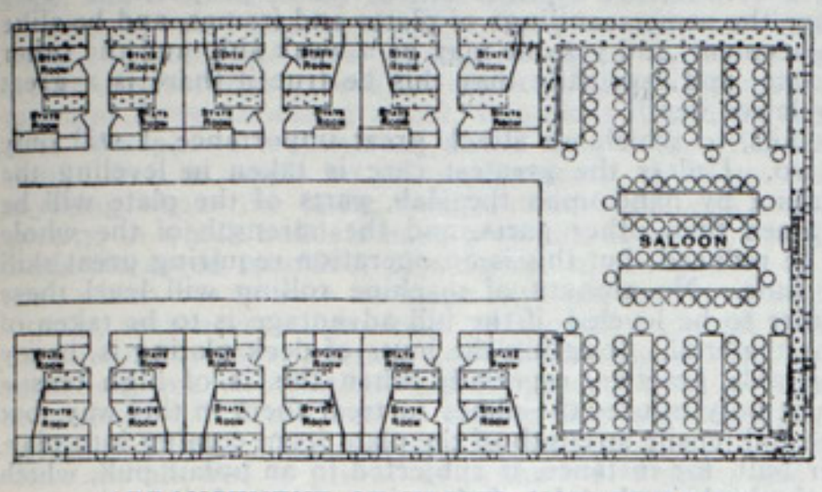
## REVENUE CUTTER BILL PASSED.

The house of representatives has passed the senate bill to promote the efficiency of the revenue cutter service. The bill gives the commissioned officers of the revenue cutter service relative rank as follows: Captains, with majors in the army and lieutenant commanders in the navy; first-lieutenants, with captains in the army and lieutenants in the navy; second-lieutenants, with first-lieutenants in the army and lieutenants, junior grade, in the navy; third-lieutenants, with second-lieutenants in the army and ensigns in the navy. It gives the officers of the service longevity pay equivalent to the corresponding rank in the army and provides for their retirement with three-fourths pay for disability, or upon reaching the age limit of sixty-four years.

John Haug, consulting engineer and naval architect, is now located in the Bourse building, Philadelphia.

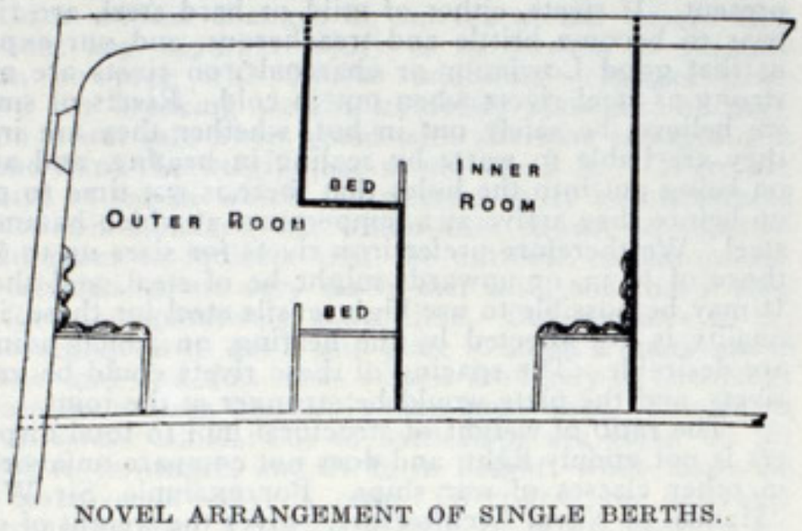
## PASSENGER ACCOMMODATIONS IN STEAMSHIPS.

Several interesting facts were brought out recently in a paper read before the Northeast Coast Institution of Engineers and Ship Builders by Mr. C. James on the subject of "Passenger Accommodations in Steamships." In the course of his paper the author stated that from the earliest ages there has been constructed on shipboard accommodation of one kind or other for those navigating or working the ship, and rooms or cabins have been provided in special cases for those simply journeying on the ship. Such accommodation was generally of a severely plain and simple character, though in some ships of the ancients very luxurious quarters seem to have been fitted, such, for instance, as those referred to by Athenius in his description of that marvelous, if somewhat mythical vessel said to have been built by Archimedes about 250 years B. C. This craft is reputed to have had on the middle deck thirty rooms, in each of which were four beds, and there were besides baths, gardens, a library and many other conveniences. The decorations, too, were extremely elaborate, the stanchions supporting the upper deck representing statues of Atlas and the ceiling representing the heavens.




ARRANGEMENT OF VESSEL NOW BUILDING.

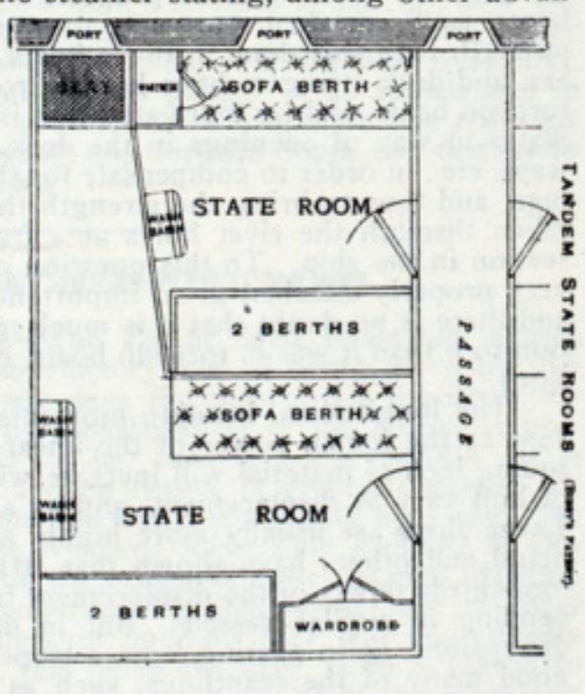
Cabins were first introduced into English ships about the middle of the thirteenth century, and in the year 1242 orders were given that "decent chambers" were to be constructed in a ship in which the king and queen were to proceed to Gascony, but for centuries afterwards the cabins in English ships were of the simplest character.




NOVEL ARRANGEMENT OF SINGLE BERTHS.

In the old clipper ships which carried passengers the cabins were exceedingly cribbed and confined, but with the advent of steam vessels considerably more attention appears to have been given to the accommodation for the passengers, for in the year 1838 we find the advertisement of the first voyage of a new Atlantic steamer stating, among other advantages, that her accommodation was "capacious and well arranged for comfort"; later on in the same year another new Atlantic steamer is described as having staterooms "exceedingly handsome and commodious, each having two berths or beds, except two rooms, which are fitted for the peculiar accommodation of a party, with three beds." There was also some attempt at artistic decoration, for the description states, "the coloring of these rooms is a warm delicate pink, with gorgeous damask silk hangings to correspond of French white, with crimson satin stripes."

In 1850 important advances appear to have been made, for in a description of a new Atlantic steamer completed in that year it is stated that "two of the staterooms for first-class passengers have four berths in each, all the others having only two," and the description of the passenger accommodation is summed up with the statement that "nothing has been left undone which science and ingenuity can suggest to add to the comfort and convenience of the passengers."




TANDEM STATEROOMS.

Another important improvement was announced in 1871, when the White Star line advertised steamers whose "staterooms with saloon and smoking rooms are placed amidships, and cabin passengers are thus removed from the noise and motion experienced at the after part of the vessel."

After describing the changes that have taken place during the last twenty years the author dealt with the new arrangement of tandem staterooms recently patented by Mr. A. W. Bibby of Liverpool, a gentleman who is prominently identified with the Bibby line and the Pacific Navigation Co. The object of the new arrangement is to make the unpopular inner cabin, which has generally to be let at a lower price, become the favorite one; by lengthening the inner room and so forming a sort of passage from it to the ship's side, light and ventilation are got directly into the room from a port on the side, and the room being away from the ship's skin is thus cooler than the outside rooms, besides having considerably greater floor area. In many of the latest passenger liners a number of cabins are fitted on deck on the sides of deck houses. These cabins are very comfortable and convenient, and are eminently suited for hot climates. Another modern invention consists in arranging certain cabins en suite for the convenience of families. A noticeable feature, too, is the great improvement in the general get-up and arrangement of the second and third-class quarters. In many of the leading liners the second-class cabins are so well fitted as to be nearly equal to the first-class, whilst the modern third-class quarters are frequently quite equal to if not better than the first-class cabins were in many of the older ships. A prominent example of this is to be found in the third-class accommodation as fitted in the Tyne-built Cunard liner Ivernia. An ingenious arrangement of single-berthed room, though somewhat cramped, is shown in the first figure; it has been adopted in some Atlantic liners.

## OBSERVATIONS WHEN TORPEDO BOATS WERE STARTED.

In the light of the present agitation in ship building circles concerning the speed of torpedo boats and destroyers, the following comments, made three years ago, by Mr. William A. Fairburn, are interesting. They were made in a discussion of Lieut. Niblack's paper on "Torpedo Boat Design," which was read at the 1899 meeting of the Society of Naval Architects and Marine Engineers in New York:

"The new successful torpedo boat building firms—whether they be new firms just springing up, without any building experience, or old established firms now branching out into light construction—will be those who are now following the plans of such builders as Thornycroft, Yarrow and Normand, and the firms which in some respects are apparently original, breaking away from old traditions and making innovations, will probably discover by bitter experience that a speed of 28 or 30 knots, although lightly spoken of today, is nevertheless a difficult proposition and cannot be attained without gradual steady progression. If a firm is not willing to profit by another's experience, it must of necessity go over very nearly the same ground that other firms have traversed and meet evils and discouragements of a similar nature to those that they have encountered and overcome in the past. I think that the ship builders who contracted to build torpedo boats and destroyers from United States navy department's designs fifteen months ago exhibited a great amount of courage. Such firms are bound down and limited on every side; they take a great deal of responsibility, and the most optimistic cannot feel confident of satisfactory results and probable success. The contractors, most of whom, however, are inexperienced firms, guarantee results without voice in the matter, and therefore exercise a blind, unreasonable faith in the department's ability to design successful torpedo boat craft. Other governments, with great experience in torpedo boat construction, and with navies containing hundreds of these little craft, have not as yet considered it advisable to prepare their own designs. I think, therefore, that it is poor policy for the United States navy department to attempt designing before they have had experience with various types of these vessels. There are many types of successful torpedo boats, but when a compromise is attempted and the so-called good features of all are embodied into one design the results are usually disastrous.

"A practical ship builder with little or no knowledge of the science of naval architecture may successfully build coasting schooners or passenger steamboats, but when it comes to torpedo boat design practical experience and guesswork amount to nothing, and theory, science and art must take their place. The practical construction of the torpedo boat is as much different from that of the merchant steamer as the mechanism of a watch is from that of a tower clock. No ship building firm will ever make a success of torpedo boat construction which does not appreciate the delicacy of the work. Big ship methods must be discarded, the 'guess of about so much' omitted, and all parts of the vessel and her machinery carefully proportioned to withstand a certain stress with a certain factor of safety. A special department for the construction of torpedo boats is a most desirable arrangement when large ship building firms contract for this type of vessels, and a first-class designer and theoretical man, together with a first-class practical man experienced in this class of work, are essential if the establishment is to make a success of the construction of torpedo craft. Ship building firms that appreciate the greatness of the undertaking, the delicacy of the work, the difficulty and necessity of obtaining a good design, and the many obstacles that will have to be overcome before they can obtain the required speed, when they make their estimate of cost will probably make a success of this class of work. First-class technical men can be obtained to take charge of the work if the inducements made are great enough. The difficulties of torpedo boat design are alike in both hull and machinery. The hull must be designed as light and as rigid as possible consistent with strength, and of such shape as to be easily propelled through the water the required speed. The machinery must be capable of developing maximum power with the least possible weight, and it must also be durable, compact, accessible and economical. High speed, with light hulls, quick running, light machinery and express water-tube boilers is not as easy to obtain as some builders seem to think. Great care should be taken to have the design all right in the first place. When the boats are built and ready for trial, even if the design is first-class in every respect, the builder's troubles commence. The firemen must be trained to work like so many machines, and it requires great skill and a strong constitution to fire these boilers, with grates as long as 9 or 10 ft. and a consumption of about 70 lbs. of coal per square foot of grate per hour. Great skill must be displayed by the engineer who has charge of this 'tuning up,' and the way the trials are conducted is almost responsible for one-half of the difficulty there is in obtaining this high speed. Unless a ship building firm has had some experience in the construction of torpedo boats it is a very difficult matter to estimate the cost of the same, and the difficulty increases as the speed increases. The present tendency of American firms is to bid ridiculously low, and some of the prices are much lower than figures for the same class of work abroad. When many of the bidders on this class of work have encountered the difficulty of building and running the trial of these especially fast boats, their figures on proposed work will be doubtless much higher than they are at present. For a large 30-knot destroyer about $900 per ton of trial displacement and $1,100 per ton weight of hull and machinery is a fair price, while a first-class 30-knot torpedo boat is worth about $1,100 and $1,300 respectively."

# TORPEDO BOAT DESTROYERS.*

BY S. W. BARNABY.

So much attention has been drawn to the destroyer class of the British navy during the past year, that no excuse is needed for a short paper on the subject. It will necessarily be short, because no full treatment of the question is possible, in view of the fact that a committee is now sitting at the admiralty, and is investigating all the cases in which defects due to weakness of construction are reported to have developed during service at sea. I shall not therefore attempt to discuss these cases, because the facts have not been authoritatively made known. Neither do I wish to express an opinion as to the loss of the Cobra. I will only say that, although she was an exceptional and experimental vessel, still, if we are to believe that no injury to the bottom preceded the accident, it must be considered surprising that no preliminary straining or laboring of the joints gave warning of danger. We have no experience of mild steel, of the high quality to which we have become accustomed, having failed suddenly, even under repeated applications of stresses well within the elastic limit of the material; but as to what really happened, the evidence, to my mind, is not at all conclusive.

The problem which was originally set the destroyer builders was, to produce a small vessel which would be faster than a torpedo boat, and would carry a heavier armament. These were the sole conditions imposed. Messrs. Yarrow and ourselves, who made the first designs, naturally worked on the lines of the torpedo boats which we had been building for years. Speaking for ourselves, we had confidence, from our experience with these boats, that if destroyers were developed on the same lines they would be at least as seaworthy as torpedo boats, if not more so. We had built over 200, some of which had made voyages in all weathers and to all parts of the world, and not one had been lost at sea through insufficient strength. We considered that they must be amply strong to live through any weather in which they might be caught, but that the officers and men might reasonably be asked to submit to the same amount of discomfort at sea as was borne by the crews of torpedo boats, seeing that they were designed for the special purpose of catching these boats.

The torpedo gunboat of 800 or 1,000 tons is probably the smallest vessel in which any degree of comfort for the crew can be secured when it is necessary to remain constantly at sea; but although the torpedo gunboats may be able to overhaul torpedo boats in rough weather because of their size, a class was wanted which would overtake them in any weather, and I think this want has been met by the present destroyers. So far as I know, this condition of discomfort has been cheerfully accepted by the navy, and the important question is, Can these small vessels of high speed be made reasonably safe at sea? I think there is no doubt that they can. The strains coming upon a ship among waves are not exactly, or even approximately, calculable. The effect of the inertia forces produced by the rapid motion of the ends of the vessel as she pitches and scends cannot be estimated, because the velocity of the motion of the parts is not determinable. It is not necessary to enumerate the complex forces produced by the motion in a seaway; it is sufficiently evident that the data for exact calculation are altogether wanting. Then, again, while at one moment the deck of the vessel forms the top of the girder and the keel the bottom, at the next moment the rolling of the vessel may make the corner of the deck take the place of the top, and the opposite bilge that of the bottom of the girder. All that it is possible to do is to establish a scale of comparison by which we may judge of the safety of one vessel by comparing her with another which has shown no sign of distress during the time that she has been at sea, and even then it is always possible that exceptional circumstances may occur which may cause us to modify from time to time our standard of comparison.

It is usual to suppose that by considering the vessel first as poised upon the summit of a wave of her own length, and then as lying between the crests of a pair of such waves, and reducing the hull to the form of an equivalent girder, that a method of comparing the stresses to which ships are subjected at sea is possible. The vessel may never be in such a condition, probably never is, and if she were, the stresses would doubtless be different from what they are calculated to be; but in default of a better way of ascertaining if a given ship stands at least as good a chance of safety at sea as some other ship which has proved to be satisfactory, the test is a valuable one. It is usual to assume the height of the wave for vessels of this size as about one-twentieth of the length, and some idea of the severity of the supposed conditions may be obtained when it is stated that it means that a 210-ft. destroyer is immersed to the gunwale at the two ends, and that only about 2¾ ft. of the depth of the hull amidships is in the water when she is lying in the trough; and that when poised on the crest, about 34 ft. of each extremity of the ship is out of the water altogether.

It is, of course, of great importance that the deck should not only be sufficiently strong to avoid buckling locally under compressive strains, but that the form of the deck, as a whole, should be rigidly maintained. In the long machinery compartments, where there are no bulkheads, either transverse or longitudinal, great care needs to be taken that the deck beams and longitudinal deck girders are sufficiently strong for the purpose. In some of the latest destroyers built abroad, where the engines are placed between the boilers, the coal bunker bulkheads are continuous through the engine room, and greatly add to the strength amidships, but this arrangement obliges the engines to be placed one in front of the other, since there is not sufficient width for them to be abreast. This so greatly adds to the length of the ship, and consequently to the bending moment, that it is, to my mind, a doubtful advantage. The longitudinals and deep beams over these spaces will no doubt be reinforced in boats in which any tendency to bending has been observed. I think that they might with advantage be further supported by pillars, in order to strengthen the deck to withstand the compression to which it is subjected under a sagging moment. Our practice has been to make the deck perfectly straight for the greater part of the length of the ship, giving no sheer except at the bow. Any sheer amidships prevents the deck from taking its proper share of the tension coming upon the upper works under hogging moments, and throws undue stress upon the sheer strake.

One of the most important factors determining the strength or weakness of a destroyer—more important, in my opinion, than the thickness of the plating—is the ratio of depth to length. In the Albatross, which is the longest we have built, there are 15¼ depths in the length; but in some of the class, I believe, the depth is much less in proportion. Two destroyers may have the same scantlings of plates and frames, and be alike in length and displacement, and yet one may be a weak ship and the other a perfectly sound one; and especially may this be true if there is a great disproportion in relative depth.

As regards details, to which we attach great importance, I will only mention one or two. Unless the greatest care is taken in leveling the shell and deck plating by hand upon the slab, parts of the plate will be more severely strained than other parts, and the strength of the whole plate will thereby be reduced; but this is an operation requiring great skill and taking much time. No amount of machine rolling will level these plates as they require to be leveled if the full advantage is to be taken of every pound of the material. Joggling the butts of deck plating is, in my opinion, an undesirable practice, especially when this is of high tensile steel. I think it not only injures the plates to treat them in this way, but it also prevents the full tensile strength of the plate from coming into play. A joggled stringer butt, for instance, is subjected to an unfair pull, which has to straighten the kink in the plate before it can stretch it, and an excessive strain is thrown on the sheer strake.

The riveting is another detail requiring the greatest care, and we never allow this to be done by piecework. The introduction of high tensile steel has made the question of riveting of still greater importance. The value of this material would be much enhanced if rivets of the same strength could be employed; but there are difficulties attending its use, and not much experience has been gained with hard steel rivets up to the present. If rivets, either of mild or hard steel, are riveted cold, they appear to become brittle and treacherous, and our experience has satisfied us that good Lowmoor or charcoal iron rivets are more reliable, and as strong as steel rivets when put in cold. Rivets of small diameter cannot, we believe, be safely put in hot, whether they are iron or steel, because they are liable to waste by scaling in heating, and are cooled so rapidly on being put into the holes that there is not time to properly knock them up before they arrive at a temperature at which hammering is injurious to steel. We therefore prefer iron rivets for sizes up to ⅜ in. or 7/16 in., but those of ½ in. or upwards might be of steel, and should be worked hot. It may be possible to use high tensile steel for these, if it is certain that its quality is not affected by the heating, on which point more experiments are desirable. The spacing of these rivets could be greater than with iron rivets, and the plate would be stronger at the joint.

The ratio of weight of structural hull to total displacement in destroyers is not unduly light, and does not compare unfavorably with that found in other classes of war ships. For example, Sir William White, in his "Manual of Naval Architecture," gives the weight of material contributing to structural strength in a steel-built first-class battleship of the present day as 18 per cent. of the total displacement, and for a typical swift protected cruiser of high speed, large coal supply, and heavily armed, as 20½ per cent. of the total displacement. This is considerably less than the percentage of weight of material contributing to structural strength in torpedo boats and torpedo boat destroyers. Although the Thornycroft destroyers are not longer in proportion to depth than the earlier torpedo boats, we have taken more care to preserve the continuity of longitudinal strength than was done in those boats. Continuous keelsons, side stringers, and deck stringers have been introduced which were not fitted in the torpedo boats, and far more attention is now paid to the fitting of doubling plates in way of openings in the deck, such as funnels, fan cowls, hatchways, etc., in order to compensate for the material cut away by these openings, and thus to bring the strength there up to that of a normal section taken through the rivet holes at a frame, which should be the weakest section in the ship. To this question of compensation the admiralty have very properly attached great importance in all their recent specifications, and there is no doubt that it is much more necessary to pay careful attention to it than it was in torpedo boats, on account of the increase in dimensions.

The longitudinal bending moments for similar ships on similar waves vary as the fourth power of the linear dimensions, so that the stress per square inch of material will increase with increase of dimensions if weight of hull vary as displacement, and as a rule this is found to be the case. Large ships are usually more highly stressed than small ones. M. Normand and others have shown that structural weights should vary as the four-thirds power of the displacement for equal stresses under longitudinal bending in similar vessels. But in dealing with moderate increases of dimensions, as in passing from a torpedo boat to a destroyer, there are a good many of the scantlings, such as plating over propellers, doublings and chafing plates in way of anchors, coal bunker bulkheads and shoveling flats, and other parts which do not count for much in structural strength, but which require to be of a certain minimum thickness for local strength in the smaller vessel, and which do not need to be increased in the same proportion as the rest. The weight thus economized can be utilized in thickening the deck, keel, and sheer strake amidships above their proper proportion, and thus the stresses per square inch of material do not rise at the rate that they would otherwise do. At a matter of fact, we have found that by improvements in structural detail, such as I have mentioned, it has been possible to keep the estimated stresses in a seaway down to a figure which allows a good factor of safety, taking into consideration the strength of the high tensile steel employed.

There is no reason why boats having speeds of 30 or 31 knots at light draught should not be as capable of living through bad weather as a torpedo boat. This was the original standard: and provided that they are equally well proportioned and equally well built, they should run no greater risks than their prototypes did. If a higher standard of strength than this is now considered desirable for destroyers for the British navy, so that instead of working from a base they may always accompany the fleet at sea, I believe this requirement can be met without a great sacrifice of speed. It would be unfortunate if the exaggerated impression which has got abroad as to the frailty of destroyers as a class should lead to a swing of the pendulum in the direction of increase of weight which should

* Paper read before the Institution of Naval Architects.

greatly exceed the necessities of the case. If we go to such heavy scantlings, or if we so increase the dimensions in order to secure comfort at sea, that destroyers can no longer be fast enough to overtake torpedo boats in smooth water, would not their usefulness be much impaired? Other nations will probably continue to build small fast craft of this description, in which comfort is sacrificed to speed and efficiency, and can we afford to be left behind?

The present destroyers, like the torpedo boats, are lightly built at the ends, and it is necessary to give special attention to the bow plating and framing in new boats, so that they may be able to maintain speed in rough water. Besides the local strengthening of the bows and a moderate increase of scantlings generally—say from 10 to 15 per cent.—to enable them to stand more knocking about, I think it would be wise to increase the ratio of depth to length even above that of the Albatross. The strength should then be ample for all requirements. I do not feel at liberty to say anything about the latest designs that have been called for by the admiralty, in which builders have been left, as usual, a fairly free hand. The moderate speed specified, 25½ knots, is due chiefly to the conditions of trial, which has now to be made with full load on board, and not, as previously, with a very light load. Although I should have preferred to see the trial made under average conditions of load—that is, in fully equipped condition, but with bunkers half full, rather than in either of the extremes of loading, still I can see no reason why thoroughly good boats should not be built under the new conditions laid down, provided that moderate views are allowed to prevail as to the hull weights and dimensions which are left to the judgment of the designer. They will not be as fast at a light draught of water as the present boats are in that condition, but their speed will be increasing all the time as the coal burns out, and the average speed should be considerably more than that obtained on trial.

In view of recent events, what is a safe stress upon the material either of the deck in compression or upon the keel in tension? Do our views upon the subject require modification, and, if so, to what extent? Fairbairn found, many years ago, that the joints of an iron riveted girder sustained upwards of three million changes of one-fourth the weight that would break it without any apparent injury to its powers of ultimate resistance. It broke, however, with 313,000 additional changes when loaded with one-third the breaking weight, evidently showing, he says, that "the construction is not safe when tested with alternate changes of a load equivalent to one-third the weight that would break it." There are numbers of large ships at sea in which the stresses must be considered very high if judged by this standard, but which have shown no signs of distress. This would seem to indicate that the extreme conditions assumed in the stress calculations are very rarely met with, and that if they do occur, they last for a comparatively short time. But we have to remember that it is more difficult to get a thin plate to stand a compressive strain than a thick one, and also that small vessels are likely to encounter waves which will strain them more frequently than large ones. The waves which are assumed in stress calculations of battleships are given by Sir William White as 383 ft. in length, and 24 ft. in height; while those assumed for a 210-ft. destroyer are 10½ ft. only. Of course, the destroyer which has to keep company with a battleship may be called upon to encounter the 24-ft. waves; but these, on account of their greater length, do not produce such a severe bending moment as the smaller wave. The boat cannot stretch from crest to crest, and is better supported than upon the shorter waves of less height. But, as I said before, these calculations cannot be depended upon for exact figures, and are only useful as methods of comparison.

I have my own opinion as to how high a stress it is safe to allow, but it would serve no useful purpose to attempt to fix a definite limit where so much depends upon workmanship and other indeterminate quantities. The builder's own experience should be his guide. If all vessels had to be built to the rules of insurance societies there might be less risk, but there would certainly be less progress; and torpedo boats and destroyers could never have come into existence.

## SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., April 9.—The Pacific Mail steamship Korea, which was recently given a most satisfactory trial, is being given the last of the finishing touches and in a few days the date of her departure for the Pacific will be announced. The Siberia, sister of the Korea, is progressing rapidly and will be ready for her trial in a few months. It is reported that the ship yard stands a good chance of getting contracts for two more lumber ships similar to the one which is building here now. The company which contracted with the Newport News Ship Building & Dry Dock Co. to construct a vessel for the redwood trade between Eureka, Cal., and San Francisco, has announced that this is the first of three similar ships for its business. The ship building here will undoubtedly come up to all requirements, and, this being the case, there is reason to believe that this company will be favored in the award of the other two contracts.

The foundry which was recently purchased by the ship yard from Caskey Bros., the Philadelphia foundrymen, is now in operation and is under the direction of Charles Hamilton, who has had years of experience in the business. Heretofore the ship yard has let its work out by contract, but in future it will attend to its own foundry needs. The plant is located opposite the yard.

Two steel boilers recently finished here for the revenue cutter Tuscarora, building at Trigg's ship yard, Richmond, have been shipped to that plant for installation. The ship yard recently built two other boilers for a vessel building at the Richmond yard. It is stated that the United States cruiser Galveston, which the Trigg company is building, will be ready to launch in June. The same company will put overboard in about a month the large tug Lancaster, building for the Pennsylvania railway.

The Red D line steamship Maracaibo arrived in port Tuesday from Porto Rico, bringing the Second battalion, Eleventh United States infantry, which had been on duty there for nearly four years. About 260 of the men were paid off and discharged here, and about 130 left the same afternoon for San Francisco, there to board a transport for Manila, where they will be stationed permanently.

The Norfolk navy yard has considerable repair work on hand, a number of government vessels receiving attention there.

## OFFICERS OF LAKE VESSELS FOR 1902.

**BRADLEY, M. A., Cleveland.**

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|---|---|---|---|---|---|
| Str. Alva | Capt. | M. Mulholland | Engr. | E. C. Castle. |
| " Geo. Stone | " | C. H. Francke | " | ..... |
| " Hesper | " | J. A. Holmes | " | J. H. Abbott. |
| " Pasadena | " | Jas. Buchanon | " | Geo. W. Cross. |
| " Gladstone | " | Paul Howell | " | W. Lockhart. |
| " M. B. Grover | " | C. R. Baker | " | Jas. Twohig. |
| " R. P. Ranney | " | A. E. Bullock | " | H. A. Vaughan. |
| " Fred Kelley | " | ..... | " | J. A. Breckley. |
| " J. S. Fay | " | J. A. Garant | " | H. S. Brakeman. |
| " S. E. Sheldon | " | Geo. McGraw | " | Jno. Walsh. |
| Schr. Adriatic | " | Fred Green. | | |
| " A. Cobb | " | N. Gifford. | | |
| " T. Quayle | " | ..... | | |
| " Sandusky | " | W. A. Serles. | | |
| " Negaunee | " | O. C. Olson. | | |
| " D. P. Rhodes | " | F. Brown. | | |

**MITCHELL & CO., Cleveland.**

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| Str. James Gayley | Capt. | C. D. Galton | Engr. | Wm. Fetting. |
| " Wm. H. Gratwick. | " | R. C. Jackson | " | R. J. Hannan. |
| " J. J. Albright | " | M. P. Parsons | " | P. Laveley. |
| " Walter Scranton | " | H. H. Townsend. | " | Gus Guy. |
| " W. E. Reis | " | B. D. Townsend | " | Lewis Minnie. |
| " H. C. Frick | " | W. W. Sharkey | " | F. Parker. |
| " M. A. Hanna | " | Alex. Beggs | " | Jno. Riley. |
| " H. S. Holden | " | F. D. Galton | " | Wm. Fritz. |
| " Lagonda | " | Jno. Baird | " | I. Francombe. |
| " J. J. McWilliams | " | F. Furtaw | " | H. Graves. |
| " Major | " | Gus E. Anderson. | " | T. J. McCabe. |
| " R. L. Fryer | " | M. Stewart | " | F. Thomas. |
| " Geo. T. Hope | " | Edward Johnson. | " | Gilbert Newton. |
| Schr. Troy | " | H. C. Diem. | | |

**McMORRAN, HENRY, Port Huron, Mich.**

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| Str. Gogebic | Capt. | Wm. D. Neal | Engr. | Ed. Mehner. |
| " M. Ross | " | D. Purdy | " | ..... |
| " Pawnee | " | Geo. Tremble | " | Jno. Cameron. |
| " Newaygo | " | Jas. Fleck | " | R. Shinskie. |
| " Britannic | " | E. H. Davis | " | F. Cadotte. |

**WHITE LINE TRANS. CO., W. H. Singer, Gen. Mgr., Duluth.**

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| Str. Mabel Bradshaw | Capt. | A. Clausen | Engr. | L. W. Griggs. |
| " Bon Ami | " | H. J. Hawkes | " | S. Cleveland. |
| " Iroquois | " | ..... | " | ..... |

**MUSKEGON STEAM BARGE CO., Muskegon, Mich.**

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| Str. S. M. Stephenson | Capt. | Jas. Sanford | Engr. | Henry Connell. |
| " Jno. Otis | " | Jno. Waller | " | D. McMillan. |
| " Mathew Wilson | " | J. N. Comstock | " | Dan McMillan. |

**KEITH, & CO., J. G., Chicago.**

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| Str. Ira H. Owen | Capt. | Jno. W. Cochrane | Engr. | Jas. S. Taylor. |
| " Parks Foster | " | D. J. Duncanson. | " | H. Buchanon. |
| " M. T. Greene | " | P. F. Powrie | " | M. Reck. |

**CANADIAN PACIFIC RAILWAY CO., Owen Sound, Ont.**

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|---|---|---|---|---|---|
| Str. Manitoba | Capt. | E. B. Anderson. | Engr. | Wm. Lewis. |
| " Athabasca | " | Geo. McDougall | " | Wm. Lockerbie. |
| " Alberta | " | Jas. McAllister | " | A. Cameron. |

**LONSBY, CHAS., Mt. Clemens, Mich.**

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| Str. Ida E. | Capt. | H. D. Moore | Engr. | G. Robertson. |
| " Clinton | " | Thos. Foster | " | Arthur Peltier. |

**LaCROIX, GILBERT, Mt. Clemens, Mich.**

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| Str. A. D. Hayward | Capt. | F. S. Forton | Engr. | Aug. Mants. |

**BEYSCHLAG, CHARLES, St. Clair, Mich.**

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| Str. America | Capt. | Henry Leisk | Engr. | W. H. Beale. |

**SMITH, L. P. & J. A., Cleveland.**

Own barges Baldwin and Mikado; names of officers not announced on opening of navigation.

**WINEMAN, HENRY, Jr., Detroit.**

Owns steamers Tampa, City of Berlin and Raleigh and schooners Aurora and Tokio; names of officers not announced on opening of navigation.

**TEAGAN BROS., Detroit.**

Own steamers Samoa, Pickands and Hurlbut and schooner D. K. Clint; names of officers not announced on opening of navigation.

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Beyond all question the catalogue of the Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., which has just come to hand, is the most costly that we have had the pleasure of seeing. It is unusual in its makeup, being in three parts, which fold into one. The cover is of gray stock and is embellished with a wash drawing of the sea. This drawing is an excellent one. We have rarely seen so much conveyed by a few strokes of the brush. Chinese white has been handled most effectively. The display type throughout is in orange red; the body in black. The frontispieces to each of the parts are modeled in clay, then photographed and reproduced in half tone. The illustrations throughout, of which there are several on every page, are outlined and vignetted and superbly printed. Altogether it is a triumph of catalogue making and must have entailed infinite labor and considerable expense.

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Mr. J. D. Hurley, formerly vice-president and general manager of the Standard Pneumatic Tool Co., which company was recently taken over by the Chicago Pneumatic combination, has been appointed manager of the Chicago Pneumatic Tool Co., with headquarters at Chicago.

## SHIP BUILDING IN CANADA.

That Canada is experiencing a natural yearning to build her own ships, from the ground up, is evident from the widespread discussion which is taking place upon the subject within her own borders. The following from the Canadian Manufacturer is an example:

"No iron or steel ship has ever yet been built in Canada, the plates, angles, beams, etc., of which were made in Canada. A few as fine ships as ever floated have been built here, but of imported material, which shows that we have the skill to design and the ability to execute; but we have never yet had, nor do we now have the facilities to convert the original raw materials into completed ships. The raw materials necessary in the construction of a ship are not the plates, angles and beams, but the iron ore found in such abundance in so many places in Canada. The processes of evolvement begin at the moment when the ore is taken from the earth, and every process of its development from that time until it arrives at the ship yard implies labor. The question for Canada to consider is, our iron industry having been advanced as far as it has been, if it should not be carried a couple of steps further, one in the production of plates, angles and beams, and another in the utilization of them in ship building. We now mine our own ore, convert it into pig iron, from which we make certain forms of steel, and there can be no reason why these processes should not be continued to the end desired. It all means the employment of Canadian labor and capital in the development of Canadian resources in a direction calculated to lift Canada to a plane occupied by the most advanced and prosperous nations of the earth.

"The ship building industry in Canada labors under a very peculiar disadvantage in that any vessel having British registration has free access to our domestic trade. This is imposed upon us by the British North America act, and while it operates strongly against the development of ship building in Canada, there is a feature of it which should be investigated, and if possible remedied. We raise no objection to the free entry of British-built ships owned by British subjects, but we see a great injustice in a law that allows a foreign-built ship to obtain British registry simply by sailing into a port of a neighboring British colony, making a perfunctory declaration, paying a small fee and being metamorphosed into a British ship with British register, for the special purpose of avoiding a Canadian law. This condition was not very long ago exemplified in a case where a steamer was built in the United States with Canadian capital, to ply on exclusively Canadian waters, and, to avoid the payment of the Canadian duty, was sent to a port in Newfoundland where British registry was issued to her, whereupon she was returned to Canada and employed in Canadian trade, to the manifest injustice of the Canadian ship building industry. If we must admit free entry to British ships let the law be so amended that only such ships as are constructed in British ship yards for British subjects be included in the privilege.

"Another and very important phase of this question of the employment of foreign built ships in entirely domestic trade was recently presented to the government by a delegation of ship builders, representing the Bertram Engine Works Co. and the Polson Iron Works Co. of Toronto, and the Collingwood Ship Building Co. of Collingwood, Ont., who showed that according to a recent judgment of Justice Burbidge, in the exchequer court, it appears that the item of the tariff relating to foreign made ships of other than British registration is of no effect, and that consequently such ships are free of duty. The Algoma Central Railway Co., one of the Clergue corporations, with headquarters at Sault Ste. Marie, Ont., registered the steamboat Minnie M. at that port. The customs collector there demanded $3,500 duty, because the vessel was of American make and had no British registration. British registration could have been obtained at a cost of a voyage to another British colony, namely, to Newfoundland, but that method was not resorted to. The duty was paid under protest, and the collector, who is authorized by the imperial acts operative in Canada to grant registration papers, issued the necessary documents. Proceedings were begun by the Algoma Central company to recover the duty, and were successful. The exchequer court ordered the money to be returned. This finding was not due to any conflict between the Canadian customs act and the British shipping laws, but entirely to the defect of the Canadian statute to express intent. The fourth section of the tariff act provides that 'there shall be levied and collected' duties as set forth in the schedule following upon all 'goods enumerated' or 'referred to as unenumerated,' when 'such goods are imported into Canada or taken out of warehouse for consumption therein.' The provision to impose the duty ought. Justice Burbidge considers, to be embodied in the schedule instead of being cut off from it. A ship does not come within the definition of goods as given in section three of the tariff act; 'neither,' says the judge, 'can a ship with propriety be said to be imported, and it would be absurd to refer to it as taken out of warehouse for consumption in Canada.' Therefore, he held, while 'it was the intention of parliament to impose the duties mentioned in the schedule, no authority but parliament could supply the omission and make the act effective for its purpose.' Of course the ship builders want the wording of the act changed, so as to tax foreign vessels not of British register.

"In regard to another matter the deputation made strong representation. This was in reference to supposed laxness in the administration of the coasting laws. By section 2, chapter 83, of the revised statutes of Canada, it is provided that 'no goods or passengers shall be carried by water from one part of Canada to another, except in British ships,' and save in the case of vessels belonging to a foreign nation whose navigation laws permit Canadian vessels to ply between its ports. In 1889 the Canadian government suspended this law for the season, in order to enable American vessels to assist in carrying grain from Fort William to other Canadian ports on the lower lakes. Last year it gave permits to American tugs to tow saw logs from the mouths of Canadian lumber streams to Canadian points on the lakes where there are saw mills. At present, it is said, American vessels are participating in the Canadian coasting business. To this ship builders and ship owners object, maintaining that since their ships are excluded from the American domestic trade, so American vessels should be kept out of purely Canadian trade. And they also doubt the power of the government to suspend the law.

"All other conditions are in favor of the development of a very flourishing ship building industry and merchant marine. In the northwest settlement is becoming denser, farming is becoming more scientific, diversified and productive, and every year a greater outpouring of freight comes from there. The railway system of Manitoba and the territories was far from equal to the handling of the crop before the close of navigation. A new outlet, paralleling the Canadian railroad, namely, the Canadian Northern, will make Port Arthur a busy grain shipping point next year. The merchant marine will need to grow fast in order to catch up and keep up with the tonnage that is to be handled."

## SHIP BUILDING ON THE DELAWARE.

Philadelphia, April 9.—A betterment in the transatlantic service out of this port of considerable importance is the transfer of the International Navigation Co.'s steamship Haverford from the New York and Antwerp service to the Philadelphia and Liverpool line. This vessel will replace the Waesland, sunk recently in collision off Holyhead, and will be the largest vessel ever run regularly in passenger service in local waters. The Haverford is a twin-screw steamship, built by John Brown & Co., Ltd., of Clydebank, Scotland, about two years ago. Her principal dimensions are: Length, 530 ft.; beam, 59 ft.; depth of hold, 39 ft. Her gross tonnage is 11,635.

It is rumored in local ship building circles that the International Navigation Co. intends making additions to its fine fleet, and lively interest is expressed regarding the letting of new contracts to Delaware river ship yards. The Wm. Cramp & Sons Ship & Engine Building Co. have two fine specimens of the modern freight and passenger carrier in the Kroonland and Finland, of which the first mentioned is rapidly nearing completion. They are of a type which of recent years has found great favor in the transatlantic trade, a class where the claims for large carrying capacity exceed those for speed and yet where sufficient speed is maintained to make it worth while to fit extensive passenger accommodations. The officials of the American line are inclining to the opinion that excessive speed is no longer a paramount consideration in the minds of passengers, and this is argued from the popularity of their Liverpool-Philadelphia service, in which the fastest ship is a nine-day boat.

The Cramp company is preparing to put down the keel of a freight steamship for the Clyde line. They will launch the liner Finland within the ensuing two weeks and will begin work on the new cruiser for Turkey as soon as the Finland is off the ways.

The steamship Halifax, after several months at the Harlan & Hollingsworth company's yard, has sailed for Boston to re-enter her regular service. This vessel was wrecked near Minot's light last fall and subsequently $100,000 was spent in repairs and a general overhauling.

The Central railroad of New Jersey has contracted with the Neafie & Levy Ship & Engine Building Co. for a large sea-going tug, to be delivered in six months. The new craft will be built of steel and will be 105 ft. long. She will have all the latest improvements in machinery. Her home port will be New York.

The Red Star tug New Castle, built by John H. Dialogue & Sons for Peter Wright & Sons, was given a trial on the Delaware river last Saturday. It was successful. The new craft is built of steel with a wooden deck house, and cost about $20,000. On her trial she attained a speed of 10 knots. She has single engines and is fitted with Monitor nozzle equipment for fighting fires on the river front. The New Castle will be used for harbor work. She is 85 ft. long, 20.6 ft. wide and 9 ft. deep.

## BUILDING A YACHT TO BEAT THE METEOR.

The schooner that British yachtsmen pin their faith on to beat the Meteor is now almost finished for Cecil Quentin. This yacht was designed by William Fife, Jr., and is declared to be one of the handsomest schooners ever seen. The Yachtsman, in its fitting-out number, says:

Her counter is long and extra graceful (even for a Fairlie designed boat). The bow is of the modern order of clipper bows, and with no part of his model has Mr. Fife been more successful than with this, it seems to me. High and bold forward, and with plenty of freeboard, as becomes a vessel that may be called on occasionally to make long passages, she is yet made to look light and very pleasing to the eye by means of a bit of cleverly managed sheering. Her masts are fairly close together, but not unduly so, as used to be the fashion. On the load line the new boat is 90 ft., her beam is 23 ft. and her draught 14 ft. So full and sweetly rounded is her bilge that one is instinctively reminded of the "bonnie round-sided boats" which Mr. Fife's father took so much delight in modelling and building. It will be of interest to say here that the new schooner, in relation to her length, will have about the same displacement as the highly successful yawl Latona, designed by Mr. Fife's father seven-and-twenty years ago. As to the perfection with which the schooner is being built, it will suffice to say, meantime, that she will be classed A1 at Lloyds for twenty years; moreover, that she is most skilfully strengthened by a specially designed system of web-framing. She will be steered with a tiller, and in a recent issue it was intimated that her deadwood had been so arranged that she can be fitted with a motor, without it being necessary to make any structural alterations on her. She will be manned by a crew of sixteen or seventeen, all told. She is to be a beautifully-finished boat, and the principal apartments into which her ample interior space will be divided will be a main saloon, and half a dozen principal staterooms. The main saloon will be 15 ft. in length, while it will extend the whole width of the vessel. The staterooms will be 12 ft. long by 9 ft. broad, and 7 ft. 4 in. high between decks, and they will be supplemented by very high little toilet rooms. Two large and very completely furnished bathrooms have been included in the plan, while the forecastle, pantry and minor accommodation have been thought out and arranged for with equal skill. The cabin deck is reached by a broad and easy stair, which has its start in a deckhouse 11 ft. long by 7 ft. wide. This deckhouse has been fitted with a comfortable range of seats, and, while it will be as useful a place in its own way as in all the vessel, it has been so designed as to interfere only to the minimum extent with the clean, clear sweep of the spacious deck. While the new schooner is to be a comfortable cruiser rather than a "racing machine," it is the intention, according to present arrangements, to give her first racing trial in the German emperor's Dover-Heligoland match. It is to be hoped, too, that his imperial majesty's new American craft will be there to meet her. In all probability the new Meteor, with her wider wings, would be rather smart for the Fairlie-Southampton beauty in calm weather, but it is to be hoped that in a fresh breeze the British boat might be able to make a close match of it.

## GLASGOW SHIP BUILDING LETTER.

### DESCRIPTIONS OF NEW CRUISERS AND A FEW IMPORTANT MERCHANTMEN—INTERESTING PAPERS AT THE MEETING OF THE INSTITUTION OF NAVAL ARCHITECTS.

Glasgow, March 27.—The new first-class armored cruiser Lancaster was launched a few days ago from the ship yard of Sir W. G. Armstrong, Whitworth & Co., Ltd. The Lancaster is a sister ship to the Cornwall and the Suffolk, building at Pembroke and Portsmouth dock yards respectively, and to the Berwick, Cumberland and Donegal, building on the Clyde. She was laid down on March 4, 1901. She is 440 ft. long by 66 ft. broad, and her draught of water is 24 ft. forward and 25 ft. aft, giving a displacement of 9,800 tons. The main armament of the Lancaster and her sister vessels consists of fourteen 6-in. guns. Two are carried in a twin-hooded barbette on the forecastle, and two similarly mounted are placed aft. The remainder are in casemates amidships, six being on the main deck and four on the upper deck. Thus six guns can fire ahead or astern and nine on each broadside. There are, besides, ten 12-pounders, three 3-pounders and eight Maxims, distributed over the superstructure. Two submerged torpedo tubes are also fitted. This armament is protected in the main by 4-in. armor or casemates, barbettes or hoods, while the bases of the gun positions, the water plane, and the funnel uptakes from the main deck down to 5 in. below the water line are protected by a belt of Armstrong armor varying from 4 in. to 2 in. in thickness. The usual curved protective deck, ¾ in. thick, protects machinery and magazines from shell splinters. The machinery, constructed by Hawthorn, Leslie & Co., is to develop 22,000 I.H.P., and comprises two sets of four-cylinder triple-expansion engines using steam at 250 lbs. pressure. Steam is raised by thirty-one Belleville boilers and economizers, which also provide steam for the various auxiliary machines. Four sets of dynamos are fitted with direct-acting compound engines for lighting, etc. These dynamos are of the multipolar type, supplying a direct current of 500 amperes at 100 volts pressure. There are also steam steering engines, electric boat hoist, four distilling evaporators, air-compressing machinery, ice-making machinery, etc. In the Lancaster the practice at Elswick of having an effective belt at the water-line has been carried out. The speed of the vessel will be about 23 knots.

The first-class cruiser Leviathan, built and engined at Clydebank by John Brown & Co., left the Clyde for Portsmouth on last Saturday, and anchored off Spithead after having made a most successful passage. The actual time from the Great Cumbrae lighthouse to the Nab lightship was twenty-eight hours, giving an average speed of exactly 19 knots per hour. As a proof of the very ample power and speed provided in the latest British admiralty designs, it may be stated that after passing the Lizard the revolutions of the Leviathan's engines were increased to 105 per minute, and the distance from there to St. Catherine's light, Isle of Wight, was done at 21 knots per hour, this being accomplished with only two-thirds of her boilers in use, and against the tide for the greater part of the run. The vessel will be taken up to Portsmouth dock yard to prepare for her official trials.

#### NEW MERCHANT VESSELS.

An important addition has just been made to the fleet of the Pacific Steam Navigation Co. by Caird & Co., Greenock, who, on Saturday last, launched the Mexico, a finely-modelled twin-screw steamship of 6,000 tons gross for that company's trade on the West Coast of South America. The dimensions are: Length, 418 ft.; breadth, 52 ft.; depth, 36 ft. 9 in. She is designed to carry 130 saloon and 200 third-class passengers. The builders supply triple-expansion engines of 5,000 I.H.P. The Mexico's hull and machinery have been built to the plans and specifications of the superintendents for the company, and the work has been carried out under their supervision. Designed to carry 130 first-class and 200 third-class passengers, the steamer is fitted with orlop, lower and main decks, with spar and promenade decks above, and has, in addition, a double cellular bottom fore and aft. Large and airy first-saloon cabins and accommodation for the officers are fitted up on the spar deck, while on the promenade deck there is a commodious dining saloon. On the promenade deck there is also a well fitted up smoking room in oak, and over it and the social hall are handsome cupolas in stained glass. The vessel is lighted throughout by electricity. The winches and windlasses are of the most approved type for the rapid loading and discharging of cargo; there are chambers for carrying frozen meat; and the Mexico is also fitted up for the carrying of cattle. Caird & Co. are engaged on a sister ship for the same owners.

The new twin-screw steamer Newark Castle, built for the Union-Castle Mail Steamship Co., was launched a day or two ago by Barclay, Curle & Co., Ltd., Glasgow. This vessel is one of the company's new type, built for the New York and Cape (South Africa) trade, and is sister ship to the Cawdor Castle, launched at the end of last year. She is fitted so that three or four hundred emigrants can be accommodated at the shortest notice; in addition to which permanent accommodation for a limited number of first-class passengers, and about eighty third-class passengers, is provided. The vessel has been constructed under Lloyd's special survey for their 100 A1 class, and to the board of trade requirements for a passenger certificate. She is of the shelter-deck class, built of steel, with teak decks. Her dimensions are 430 ft. length over all, beam 51 ft. 3 in., and depth to shelter deck 38 ft. 9 in., with a gross tonnage of about 5,600. Water ballast is carried fore and aft in a cellular double bottom, and in addition a midship deep tank is fitted abaft the machinery. The vessel is fitted with the Union-Castle company's usual first-class cargo discharging gear and winches, steam windlass, steam steering gear, etc. The machinery, which has been constructed by the builders, consists of two sets of triple-expansion engines and four large single-ended boilers, fitted with Howden's forced draft, capable of developing about 4,200 I.H.P. and expected to give a speed of about 14 knots on trial trip. An unusually large equipment of auxiliary machinery is provided for in the engine room, and the fittings of the hull and machinery throughout are all of the highest order.

#### PROPELLER SHAFT BEARINGS.

At the annual meeting of the Institution of Naval Architects some improved propeller shaft bearings of Clyde-built steamers were described by Mr. A. Scott Younger. He reviewed the records of fourteen propeller shafts of modern typical cargo steamers, the life varying from 56,900 miles steamed to 191,100 miles, and he sought to show that the low life was due to insufficient diameter and to steaming with too little ballast. Propeller shafts, he contended, should be more frequently examined by officials of Lloyd's register, as two years was too long a period for the extremely full steamers of the present day. As to detail in bearings, there is objection to an entirely overhung propeller with the shaft working in a slack bearing with water lubrication, and this is accountable for much trouble. A bearing abaft the propeller involves serious difficulties, but the abolishing of brass liners and the running of the shaft in a metal bearing lubricated with oil, from which water is excluded, offers great advantages. The necessity for water exclusion becomes apparent when it is remembered that the vessel might remain two or three weeks in port without turning the engines, and if water had access to the shaft considerable rusting would occur, and inevitably lead to trouble in the bearings when the voyage was resumed. As the result of research, Mr. Younger recommended an arrangement in which a brass collar ring was threaded on the shaft and bolted water-tight to the propeller, forming a smooth working surface for the packing, and protecting this part of the shaft from the action of the water. The packing box, or casing, was formed of two rings, the after one of which was made in halves for convenience of removal. This casing enclosed a rubber tube, which pressed the packing against the collar, thus forming a water-tight joint. The packing consisted of two gun metal rings, made in halves, and arranged so as to break joint. The simplest form of this packing was a thick soft rubber tube with sealed ends, having just sufficient compression to keep the rings close against the collar. In most cases this would be quite sufficient for all practical purposes; in others it might be advisable to inflate the tube. This design could readily be fitted to any existing steamer, and would be specially useful in the case of twin-screw or turbine steamers with outboard shafting supported on A brackets. In turbine steamers, where the shafts revolve at a high rate of speed, some such arrangement would allow the bearings to be properly lubricated, and thus reduce tear and wear. Mr. Younger suggested the following improvements in design as offering, perhaps, the best available solution of the problem. The use of ingot steel, hydraulically forged and without liners, the diameter to be equal to an ordinary shaft over the liners, i. e., about 1½ in. over rule size; the bearing to be white metal, and extended as close as possible to the propeller, so that the overhang might be a minimum; the shaft to be fitted with some form of after gland, so that it might run in a bath of oil, and thus prevent wear down. If these suggestions were generally adopted, Mr. Younger said, the life of propeller shafts would be greatly extended and the present lamentable list of shaft failures considerably curtailed.

The interesting subject of rolling of ships was brought before the Institution of Naval Architects by Capt. G. Russo, naval architect of the Royal Italian navy, who read a paper explaining the method adopted for ascertaining and recording results. The "navipendulum" introduced in the Italian navy by Capt. Russo was exhibited at the meeting. It enables experiments to be made to determine the effect of the fitting of bilge keels in the reduction of rolling—just as model experiments enable results to be foretold with precision as regards speed for a given power with a ship of a certain form. The influence of different lengths, etc., of bilge keels can be arrived at, and the importance of this was brought out by particulars given as to the practical application of the instrument. In the Italian battleship Re Umberto, as well as in the British battleship Revenge, the rolling was reduced from over 50° to about 20° by the fitting of bilge keels; but the addition of bilge keels had been of greater advantage to the Revenge than to the Re Umberto. The bilge keels of the latter ship are 165 ft. long, 3.28 ft. deep; the Revenge has bilge keels 200 ft. long, 3 ft. deep. In Capt. Russo's opinion the greater efficacy of the bilge keels on the Revenge must be attributed to the different form of the midship section rather than to their slightly greater area. In the Revenge the midship section allowed the bilge keels to be placed at the most protuberant part of the contour, and therefore in a condition exceptionally favorable to their action.

#### LICENSES FOR DÜRR WATER-TUBE BOILER.

The Fairfield Ship Building & Engineering Co., Glasgow, have become the licensees in the United Kingdom for the Dürr water-tube boiler. They will not construct all the boilers required in this country, as the admiralty never allows a monopoly to be maintained where naval ships are concerned, but the company will exact a royalty for Dürr boilers made by others. This boiler is of German origin and has been fitted in a number of German ships. It was one of the four types named in the first interim report of the admiralty committee on water-tube boilers as having been under consideration by the committee, because it was adopted so largely in foreign navies. The committee recommended that boilers of this type should be fitted to the third-class cruiser Medea, while at the same time Yarrow large-tube boilers were to be built into the Medusa. This has been done at Palmer's works at Jarrow-on-Tyne, and the vessel will be ready for trial in May, but before being placed on board the boilers were inspected by the boiler committee, several members of which also went to Germany to see Dürr boilers in some of the warships there. The ultimate result has been that alternative designs have been asked for and sent in for the fitting of this type of steam generator in the new cruisers of 10,200 tons, 22,000 I.H.P. and 23 knots speed, about to be ordered. These designs and tenders are being considered with others which embrace boiler arrangements on the Babcox & Wilcox, Yarrow and Niclausse principles, and also arrangements of cylindrical boilers alone, and of cylindrical in combination with water-tube boilers.

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The Townsend-Downey Ship Building & Repair Co., Shooter's Island, N. Y., has added a forge to its already extensive ship building plant. The steamer Nyassa, now undergoing repairs there, is having her stern frame reforged and is the first vessel to have her frame reforged at a repair yard in the port of New York.

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It is now understood that the floating dry dock at Havana, purchased from the Spanish government, will not be sent to the Philippines as was the original intention. Rear Admiral Bowles is said to favor the authorization by congress of a 3,000-ton dry dock for the Cavite station and a 15,000-ton dock at Olongapo.

# MARINE REVIEW

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## New Offices of the Marine Review.

**More office space has been needed by this company for some time past, but on account of the crowded condition of the Perry-Payne building, Cleveland, where we have been located for twelve years, it could not be secured in that building. The offices were therefore moved on April 1 to the Wade building, just across Superior street from the Perry-Payne, where enlarged quarters have been fittingly arranged.**

**The Marine Review Pub. Co.**

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Since the last issue of the Review the will of Cecil Rhodes has been published. No testament since the will of Cæsar has attracted more attention. Indeed he seems to have had the example of Cæsar in mind when he drew the document. It is comprehensive and capable of indefinite good. In brief, the will provides for colonial scholarships throughout the British empire and two American scholarships to each of the states and territories of the United States. The German emperor is also empowered to award fifty scholarships per annum. Rhodes' reason for this is summed up as follows: "A good understanding between England, Germany and the United States will secure the peace of the world, and educational relations form the strongest tie."

Regarding the American scholarships, Mr. Rhodes says: "I desire to encourage and foster an appreciation of the advantages which, I implicitly believe, will result from a union of the English-speaking peoples throughout the world, and to encourage in the students from the United States who will benefit by these scholarships an attachment to the country from which they have sprung; but, without, I hope, withdrawing them or their sympathies from the land of their adoption or birth."

The will provides that no student shall be qualified or disqualified for election to a scholarship on account of race or religious opinion. The will is remarkable for its directness and common sense. He wants the trustees to select boys of the Rhodes type for scholarship—those not alone adept at their books, but fond of outdoor sports and leaders in moral force. While £80 is the highest scholarship known at Oxford, Rhodes provides for a scholarship of £300, so that none of his students shall, for want of capital, miss any phase of university life. It is curious to note that this sum is reduced to £50 in the case of German students, Rhodes evidently figuring that a German's requirements are somewhat less than those of an American or Englishman.

Those who would deny to the Transvaal any shred of independence will get little encouragement from the will. The last provision is pathetic. He bequeaths all his landed property near Buluwayo and Salisbury, both in Matabeleland, to trustees, whom he directs to cultivate the land for the instruction of the people of Rhodesia. His celebrated country place at Groot Schuur is left as a residence to the "prime minister of the federal government of South Africa" when that office shall have been established. Herein lies what he sought—the federation of South Africa. Some of Rhodes' sayings which have been left on record are as follows:

Remember that sentiment rules half the world.

My life is a temporary one, but the country will remain after me.

If I forfeit my flag what have I left? If you take away my flag you take away everything.

The only awkward thing is the progress of time. We do get older and become a little hurried in our ideas because of that terrible time.

I will challenge any man or woman, however broad their ideas may be, who objects to go to church or chapel to say that they would not sometimes be better for an hour or an hour and a half in a church.

I have been interested in Aristotle's definition of virtue in the Ethics as "the highest activity of the soul living for the highest object in a perfect life." This has always seemed to me the noblest rule for a man to follow, and I have made it my rule from the first.

Life is too short after all to worry about previous lives. From the cradle to the grave—what is it? Three days at the seaside. Just that and nothing more. But although it is only three days we must be doing something. I cannot spend my time throwing stones in the water. But what is worth while doing?

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As far as can be ascertained there is no real purpose on the part of the Republican leaders in the house of representatives to pass the shipping bill during the present session. For some reason or other they are permitting the bill to go by default. It is stated that an effort will be made to pass it during the short session which convenes next December. The wonder is why no effort is made to pass it during the present session. There is no sense in shirking. The Republican party at its last national convention declared in favor of the bill and took it as an issue before the people. It was indorsed with the rest of the platform. There are undoubtedly votes enough in the house to pass it and it should be brought to a vote. The rehabilitation of the American merchant marine will not come without congressional help. One of the most popular of the arguments against the shipping bill is to point to the ship yards which are crowded with work. It is true that the few ship yards which we have in this country are crowded with work, but it is also true that the vessels which they are building are for the protected coastwise trade of the United States. Scarcely any at all are building for the foreign trade. The coastwise fleet of the United States is a fine fleet of vessels. It has reached magnificent proportions, exclusively American, because foreign vessels are debarred from the trade; but the benefits of the shipping bill do not apply to the carriers engaged in this trade. The shipping bill is designed to stimulate the foreign shipping of the United States. Only 8 per cent. of our enormous export trade goes abroad in American vessels. Ninety-two per cent. of it is carried by other nations, by far the greater part of it by Great Britain. England not only has the ships but a great system of commerce to aid her. The merchant marine of the United States cannot make headway against the established English merchant marine without assistance. It was to apply this assistance judiciously that the shipping bill was designed. According to the sober judgment of the best economists it will do what it is designed to do. The bill, therefore, should be passed in order that American vessels may earn some portion of the $200,000,000 which is annually paid for the oversea carriage of the American export trade. Other nations are alive to the needs of their merchant marine. The present issue of the Review outlines the bill to grant a bounty to French shipping which has just become a law; and also gives the main points of a measure contemplated by Russia to stimulate its ship building. Compared to the Russian proposition the American shipping bill is a very modest affair.

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If we were asked to give advice to a young man we should say, "Begin life as a radical; shatter tradition." Don't be a conservative. Untold mischief has been done by statements that have passed current as proverbs because of their tendency to become settled beliefs in the minds of the young. Countless proverbs are heresies. It isn't so very long ago that profound physicians regarded it as a wholesome condition for a wound to be liberally surrounded with pus. Today every vestige of it is instantly wiped away and the wound kept clean. One of the heresies that has been pursuing its way about the world until it is hoary with age is that ninety-five out of every 100 firms fail in business. It isn't true. The annual reports of the mercantile agencies, those monuments of statistical information, show that the total number of different concerns in business in the United States is about 1,250,000. Out of this enormous number of independent enterprises only a few over 10,000 failed last year, or less than 1 per cent. of the total, the exact percentage being 88/100ths of 1 per cent. Further than this 8,500 of those who failed, or 85 per cent. of the whole number of failures, were persons in business whose capital was less than $5,000. Undoubtedly it was the lack of a little ready money which caused these persons to fail. The greatest asset which a young man can have is courage backed by rugged and uncompromising honesty. Valor, said Napoleon, and always valor; and possibly a little of his contemptuous spirit would not be amiss, that spirit which made him exclaim with exquisite scorn: "I found the crown of France lying on the ground and I picked it up on the point of my sword." Don't take a condition as settled because it exists; don't accept a proverb as a fact. It is quite likely to be lying to you.

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## SUNDRY CIVIL BILL.

The sundry civil bill as presented to the house of representatives by the committee on appropriations provides of the expenditure of $49,323,895.73, being $12,455,542.49 less than the regular and supplemental estimates and $12,572,012.48 less than the appropriations for the last fiscal year. The bill contains the following appropriations of interest in marine circles: For a steam lighthouse tender for the seventh district, $40,000; for a lighthouse at Hillsboro inlet, west coast of Florida, $45,000; for lighthouses, beacons and fog signals, $287,000; for the lighthouse establishment, $3,701,013; for the life-saving service, $1,818,830; for the revenue cutter service, $1,282,500; for the improvements of rivers and harbors, $5,882,757.50; tender for the inspector of the ninth lighthouse district, Lake Michigan, $30,000; tender for the engineer ninth lighthouse district, Lake Michigan, $65,000; Toledo harbor light and fog signal station, $10,000; for lighthouse supplies, $475,000; for lighthouse repairs, $670,000; for the completion of revenue cutter for St. Mary's river, $37,500; improving harbor at Cleveland, $107,000; improving harbor at Buffalo, $200,000; improving harbor at Duluth, $59,727; improving harbor at Ashtabula, $200,000; improving harbor at Black river, $300,000; improving Detroit river, $136,500· improving Hay Lake channel, $144,115.

The bill also contains the following provision: "Maintenance of lights on channels of great lakes—To enable the secretary of the treasury, under the supervision of the lighthouse board, by contract or otherwise, to maintain lights necessary for the safe navigation of those channels in the connecting waterways of the great lakes which have been constructed or artificially improved by the United States government, where the same cannot properly be lighted from the American side, $4,000." This applies to the private lights in the lower Detroit river which have been maintained by the Lake Carriers' Association. The $4,000 will be used by the lighthouse board to reimburse the Lake Carriers' Association.

## FIRST SAULT STE. MARIE CANAL.

The Mining Journal of Marquette, Mich., contains the following account of the history of the construction of the first canal at Sault Ste. Marie, Mich::

"After much solicitation (in which Hon. Peter White, Hon. John Burt, Heman B. Ely, Gen. Cass, Gov. Felch and James L. Conger and others were active), congress, on Aug. 26, 1852, appropriated 750,000 acres of land for the construction of the Sault Ste. Marie ship-canal. But the action of congress was not taken without opposition. It seemed impossible for some of the older members to conceive of any sudden growth of our country such as we are familiar with. The Pacific railroads were not dreamed of. Alaska was a region in close proximity with the north pole; and yet today one of the most familiar trips made is along the lines of these railroads and to this much dreaded Arctic region. When the canal around the rapids of Sault Ste. Marie was contemplated, many were opposed to it, and Mr. Henry Clay of Kentucky took occasion to speak of the work as one beyond the range of the remotest settlements of the United States or of the moon. But the general government having acted favorably, the legislature of the state of Michigan gave its approval and the governor on Feb. 12, 1853, was authorized to appoint the following commission to construct the canal: Chauncey Joslin, Henry Ledyard, John P. Barry, Shubial Conant and Alfred Williams. These gentlemen in April, 1853, entered into a contract with Joseph Fairbanks, J. W. Brooks, Erastus Corning, August Belmont, H. Dwight, Jr., Thomas Dyer, principals, and Franklin Moore, George T. Porter, John Owen, Henry P. Baldwin and James F. Joy, sureties. These were some of the terms of the contract: The canal was to be finished May 21, 1855, and two combined locks were to be built, 350 ft. long and 70 ft. wide, with 12 ft. of water on the miter sill, this afterwards being increased to 13 ft.; and the canal which was to extend to the head of the rapids to be 5,548 ft. in length. On the date named a certificate was signed of the completion of the canal by Kingsley S. Bingham, Gov. Shubial S. Conant, Chauncey Joslin, Henry Ledyard and Alfred Williams. A certificate was also signed by John T. Clark, engineer, on May 2, and thus one of the most remarkable engineering works was completed, and one that had an immense effect on the development of the country. The estimated cost was $557,739, but the actual cost was nearly double, being $999,802.46. When we consider all the conditions under which this canal was built, we are filled with astonishment. No such canal and locks up to that time had ever been constructed and the only experience to be had was from the Erie canal where the width was only 70 ft. and the depth 7 ft., the lock being 96 ft. long, and about 20 ft. wide with a lift of about 10 ft. Perhaps in an ordinary climate the construction in the time given would not have been prohibitory, but in the region of Lake Superior, where winter commences in October in some years, and extends until the middle of May, the season was altogether too short. There was no labor to be had near at hand and cholera broke out among the laborers so that everything seemed to oppose the completion of the work, and if there had not been wonderful energy displayed, and if the directors had not been almost prodigal in the expenditure of money, the work would have been a failure; as it was, the value of the land that was received at the time was compensation for the money expended."

## IN THE LAKE SUPERIOR IRON COUNTRY.

A Duluth dispatch says that the Stewart Iron Co. has been formed to take a northern Minnesota range property that was partially developed years ago and has just passed out of a long litigation. Work will begin there shortly in unwatering the old workings. The Stevens mine will be opened this season and about 100,000 tons of ore will be shipped therefrom. This mine carries a 15-cent royalty. There is a very large amount of ore in the mine, estimated at from 25,000,000 to 30,000,000 tons, and it lies so close to the ground that it can be mined with a steam shovel. Several propositions have been submitted for the lease of the famous section thirty, at least one of which involves the payment of a bonus of several hundred thousand dollars, and all of which are for a rate of royalty that is higher than the average in the Lake Superior region. This is the property on the Vermilion range that has been in litigation for twenty years, and has recently been decided to belong to three poor men of Duluth and one wealthy individual of Milwaukee. Any one of the propositions, if accepted, and if the contemplated explorations are successful, will make all the men millionaires many times over.

At the new Helen mine, on the north shore of Lake Superior, is just completed a boarding house that has dining-room accommodations for 300 men. More than 250 men are now working in the mine, and a large shaft is being sunk, in ore all the way.

At the Mansfield mine, Crystal Falls, a rock drift is being driven on the seventh level that will be run a mile, from the old shaft to under where a new shaft is being sunk. At the point where the drift will end an upraise will connect it with the new shaft, which will call for some careful engineering both above and below the ground. This mine is now being opened to the eleventh level, and will make a fine shipment this year. It is one of the very few bessemer mines of the Menominee range.

An enormous amount of exploration will be carried on in Itasca county this year. This is the extreme western end of the Messabi range, and some finds have been made there. Attention is being attracted by the scarcity of new ore finds in other locations, and it is about the last hope of explorers on the Messabi.

Contracts for stripping 800,000 cubic yards of earth and boulders from the Burt mine have been made and work has commenced with two steam shovels. The earth will be dumped into the pit made by the underground work at the Sellers mine, which is close by. The contract is one of the largest ever made for stripping and will require several years for completion.

## SISTER TO THE SHAWMUT.

The sister ship of the Shawmut, at present unnamed, building at the works of the Maryland Steel Co., Sparrow's Point, Md., for the Boston Steamship Co. of Boston, will be launched in a few weeks, possibly within the present month. It is said that these vessels will be the largest tramps under any flag and it is gratifying to know that they are to be under the American flag. This newest leviathan measures over all 505 ft.; between perpendiculars, 488 ft.; beam, moulded, 58 ft.; depth to the upper deck, 40 ft.; with straight stem and elliptical stern and three complete steel decks. They are to be schooner-rigged, with two masts and one smokestack, six water-tight bulkheads, with a double bottom extending the entire length of the ship. In No. 3 hold are deep ballast tanks, fitted for water ballast, having a capacity of 1,000 tons, making a total water ballast capacity of about 2,500 tons. On deck are fitted nine cargo hatches and ten side-derrick posts. There will be placed about the decks twelve double-cylinder steam winches, to be used in connection with the cargo derricks. Forward are fitted a steam windlass and a full equipment of stockless anchors, each weighing 10,600 lbs. A steel deckhouse is fitted amidships for the accommodation of the deck officers. Above this is a chart room and pilot house, and above these a navigation bridge, containing a full equipment of telegraphs, both to the engine room and the steam steering gear room aft. The quarters for the sailors and firemen are fitted in a deckhouse aft. A direct-connected steam steering gear is fitted in this house, but arranged to be controlled from the navigating bridge. On each side of this deckhouse are fitted a powerful steam warping capstan.

The propelling power consists of a twin-screw, triple-expansion surface condensing engine, cylinders as follows: High-pressure, 23½ in.; intermediate-pressure, 39¼ in.; low-pressure, 63 in. in diameter, and a stroke of 45 in. These engines develop about 5,000 H.P. when running at ninety revolutions per minute. The speed is to be 14 knots. A large evaporator, capable of making forty tons of fresh water every day, will also be furnished. The ships are lighted throughout by electricity, the plant being installed in the engine room, capable of furnishing 300 lights. There are four single-ended Scotch boilers, 15 ft. in diameter and 12 ft. long, built to the requirements of the United States inspection laws, for a working pressure of 200 lbs. to the square inch. Each boiler has three corrugated furnaces, 42 in. in diameter, and a total grate surface of 280 sq. ft., the total heating surface being 11,000 sq. ft. Howden's forced draft will be used. The coal bunker capacity in these ships will be 850 tons, and 400 tons in the reserve bunker. The crew will consist of a captain and three deck officers, a chief engineer and three assistant engineers and thirty-five men, making a total of forty-three men.

## AROUND THE GREAT LAKES.

A gas buoy (10-second blinker) is stationed on Bar point shoal while the light vessel is being repaired.

C. T. Morley of Marine City has sold the steamer J. J. Hill to eastern parties. She will leave for the coast in a few weeks.

A cargo of 252,000 bushels of flax taken out of Duluth a few days ago by the steamer Howard L. Shaw is valued at about $440,000.

J. C. Gilchrist of Cleveland has bought the steamer Vulcan from Drake & Maytham of Buffalo. Mr. Gilchrist now controls sixty-seven vessels.

Congressman Sheldon had a conference with the commercial club of Menominee this week relative to the widening and deepening of Sturgeon bay canal.

Capt. Edward Saveland, one of the best known masters on the great lakes, died at his home in Milwaukee Monday, after an illness of a year. He had resided in Milwaukee about forty years.

The steamer William F. Fitch, building for the Franklin Transportation Co., of which Mr. D. R. Hanna of Cleveland is president, will be launched at the Wyandotte yard of the American Ship Building Co. Saturday.

Extensive repairs are being made on the Youghiogheny & Lehigh coal dock on St. Louis bay, Duluth. New trestle work will be built over a large share of the dock, new flooring will be laid and the dock will be generally renovated.

The report that the American Ship Building Co. has entered into a contract with officials of the Manistique, Marquette & Northern Railroad for two large car ferries to cost nearly $1,000,000 is untrue. The matter is under consideration, but is not up to the closing point.

Bartlett & Tinker, Cleveland agents of the Union Transit Co., announce that the first steamer of that line, west bound, will leave Cleveland today, April 10, and that the first steamer of the Merchants' Montreal line, of which they are also agents, will leave Cleveland, east bound, April 20.

Signals showing depth of water at the Lime-Kilns are again being displayed, under direction of the Lake Carriers' Association, from Stanley B. Smith & Co.'s dock and from the Pittsburg Coal Co.'s dock on the Detroit river. They will give the depth of water up to and including 17 ft. 5 in. No greater depth will be shown for the present.

John B. Cowle is the name selected for the large freight steamer building at the works of the Jenks Ship Building Co., Port Huron, and which was recently purchased by Capt. W. W. Brown of Cleveland. Capt. Cowle has been connected with vessel interests in Cleveland for a great number of years past. He was one of the principal stockholders in the Globe Dry Dock Co., which was absorbed by the ship building combination.

The new steamer A. E. Stewart, now being built at West Bay City for Capt. A. E. Stewart, C. F. Bielman and others, will be towed to Detroit for her boilers and machinery after she is launched. The boilers and machinery are being built by the Detroit Ship Building Co. The new boat is due to be finished and ready to go into commission July 15. She will be sailed by Capt. Fred Stewart and Robert R. Lacey will be chief engineer. Both Capt. Fred Stewart and Engineer Lacey were in the steamer C. F. Bielman before she was sold this spring.

The Fort Wayne Electric Works have just issued two bulletins devoted to their Wood system of generators. The illustrations are clear and well printed and the text is especially lucid. Both bulletins may be had upon application.

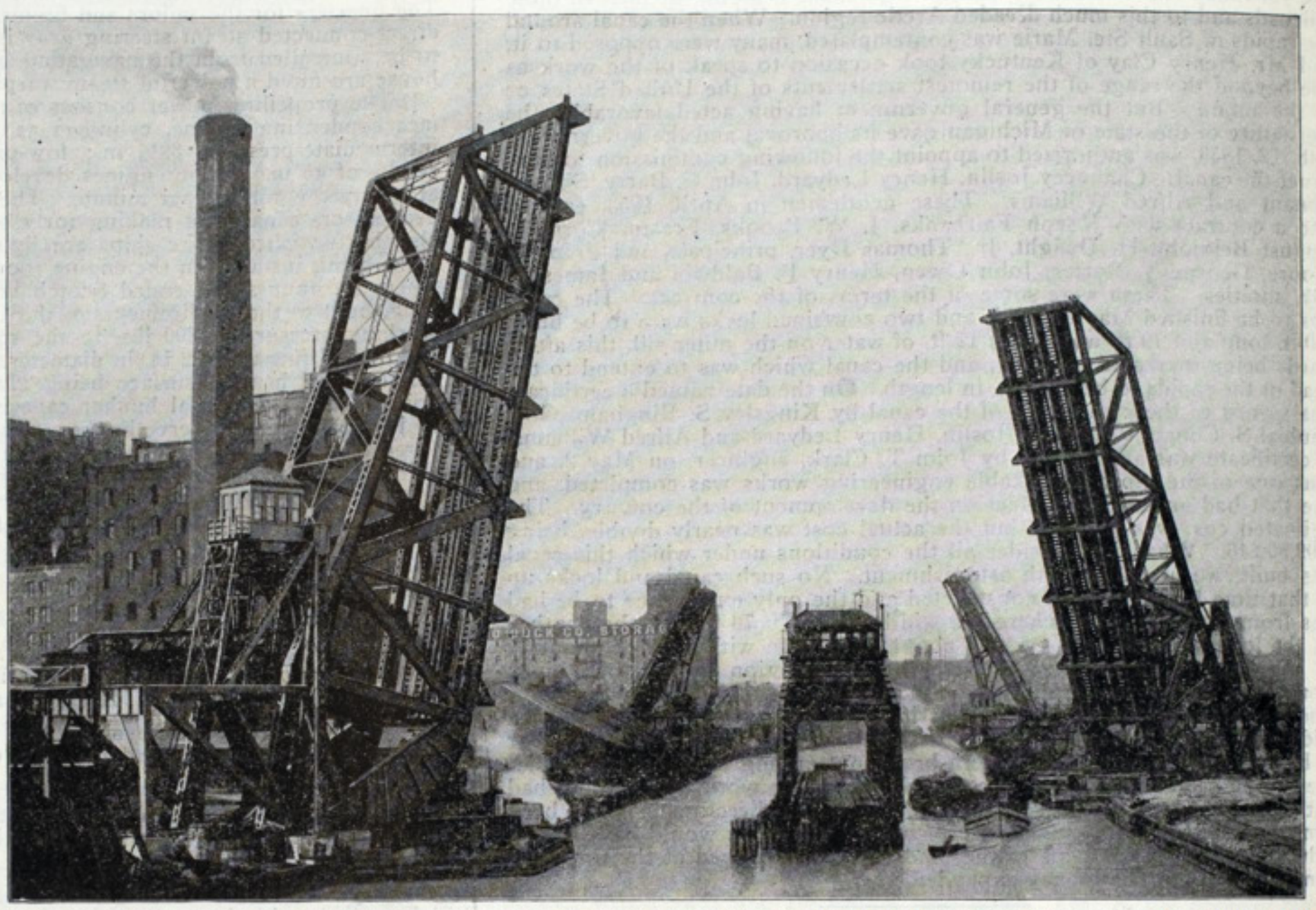
The Thames Towboat Co., New London, Conn., will build a new tugboat in its Riverside yard. The tug will be of wood and 185 ft. in length. The Neafie & Levy Ship & Engine Building Co., Philadelphia, will build the engine.

## LONGEST SPAN BASCULE BRIDGE.

### DESCRIPTION OF NEW STRUCTURE AT CHICAGO—REPLACES OBSTRUCTIVE CENTER-PIER SWING BRIDGE—DISCUSSION OF ADVANTAGES OF ROLLING LIFT TYPE OF BRIDGE.

The issue of the Marine Review of Oct. 5, 1899, contained plans with general description of the 275-ft. span Scherzer rolling lift bridge across the South branch of the Chicago river at the entrance to the Grand Central station, Chicago, and also of the adjacent Taylor street highway Scherzer rolling lift bridge, both of which bridges were to replace center-pier swing bridges. The Taylor street highway bridge was completed in January, 1901, and has been in successful operation since then. The railroad bridge was completed and has been in successful operation since July, 1901. It is the longest span bascule bridge ever built and has proved to be a safe, rigid and most rapidly-operating large movable bridge. The swing bridge which it replaced has been removed.

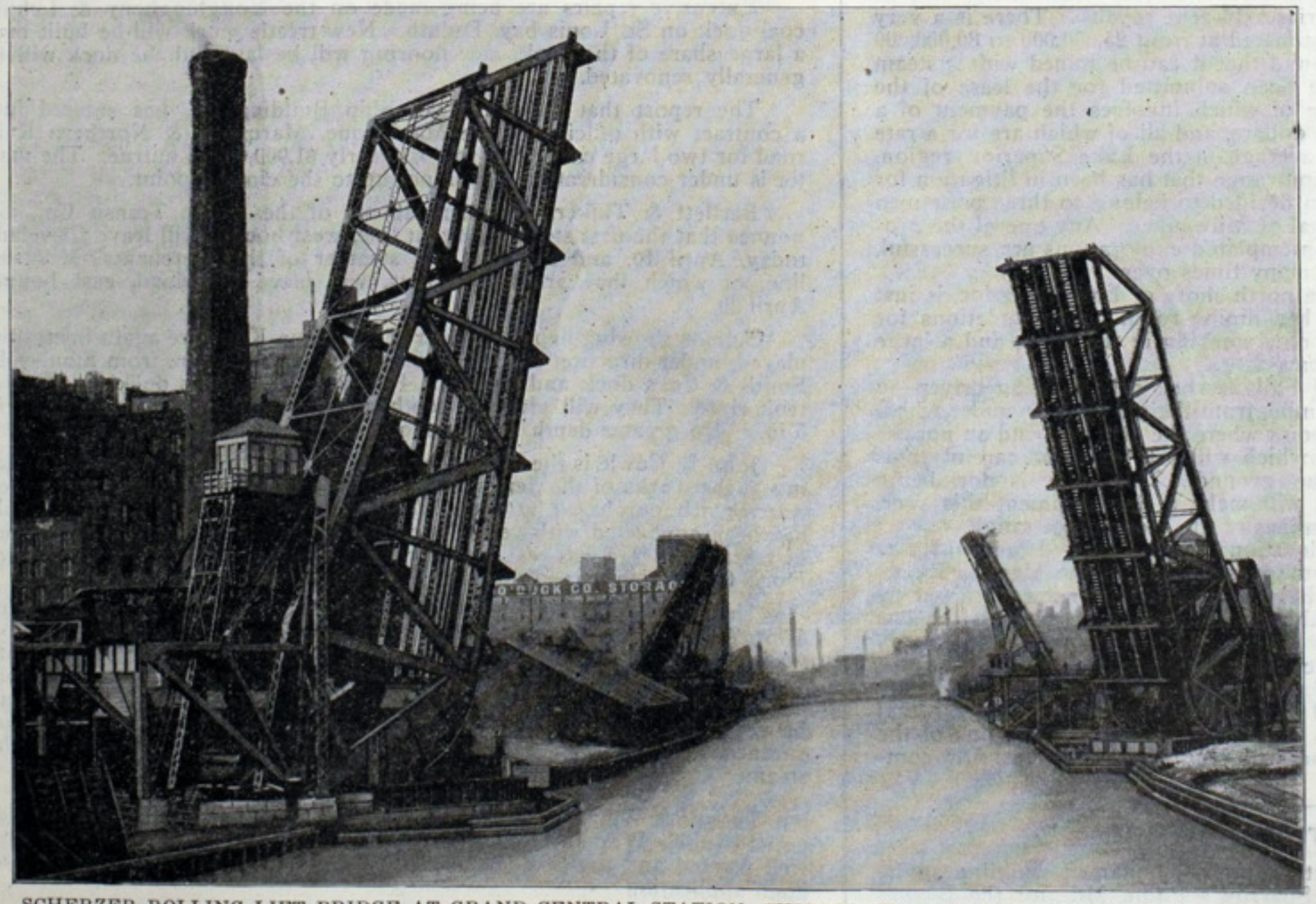
Herewith are presented three illustrations from photographic views, one being taken before and the others after the removal of the swing bridge. These views graphically illustrate some of the many advantages of this type of rolling lift bridge over the center-pier swing bridge which is now being rapidly discarded. The swing bridge shown in one of the illustrations was a double-track structure, 285 ft. in length, and was one of the best examples of its type. At the time of its removal and replacement it had only been in use about thirteen years. Yet it had frequently caused great delay to railroad and vessel traffic, because it obstructed the middle of the channel and neither of the side channels was adequate for the passage of vessels. In one instance a vessel became lodged in one of the side channels and the swing bridge was forced to remain open for twenty-four hours, during which time railroad trains could neither arrive nor depart from the station. This swing bridge was a comparatively new structure and the carrying capacity and strength were ample for decades to come, but its removal was necessary because of the defects and limitations which are inherent in all swing bridges. Many other swing bridges, also comparatively new, have been and are being removed for similar reasons.



SCHERZER ROLLING LIFT BRIDGE, 275 FT. SPAN, AT GRAND CENTRAL STATION, CHICAGO—View before removal of Swing Bridge.

As will be seen from the illustrations, in striking contrast to the swing bridge, the new bridge gives one adequate center channel for the passage of vessels, instead of two inadequate side channels as supplied by the center-pier swing bridge. The new bridge does not encroach upon either water, land or dock space, as in opening or closing it moves in a vertical direction entirely within the roadway. The swing bridge encroached upon water, land and dock space, because it moved in a horizontal direction. These illustrations show that the fundamental principle of the center-pier swing bridge is radically wrong and that every increase in the length of span or width of a swing bridge multiplies its objectionable features and makes it more obstructive to navigation, whereas the fundamental principle of the rolling lift bridge is right and each increase in length of span or width of bridge, instead of impairing, multiplies its advantages.

Vessel interests, as well as railroad and municipal engineers, have for a long time recognized the fact that the swing bridge is deficient in the essential qualities required of a movable bridge, not only for narrow channels, but also for wide navigable channels where there is ample width for pivot piers and swing spans. The essential qualities of a movable bridge are safety, adaptability, reliability, artistic outlines, economy. In support of the claim that the Scherzer rolling lift bridge is adapted to meet all these essential requirements, the following comparisons are made with the swing bridge:



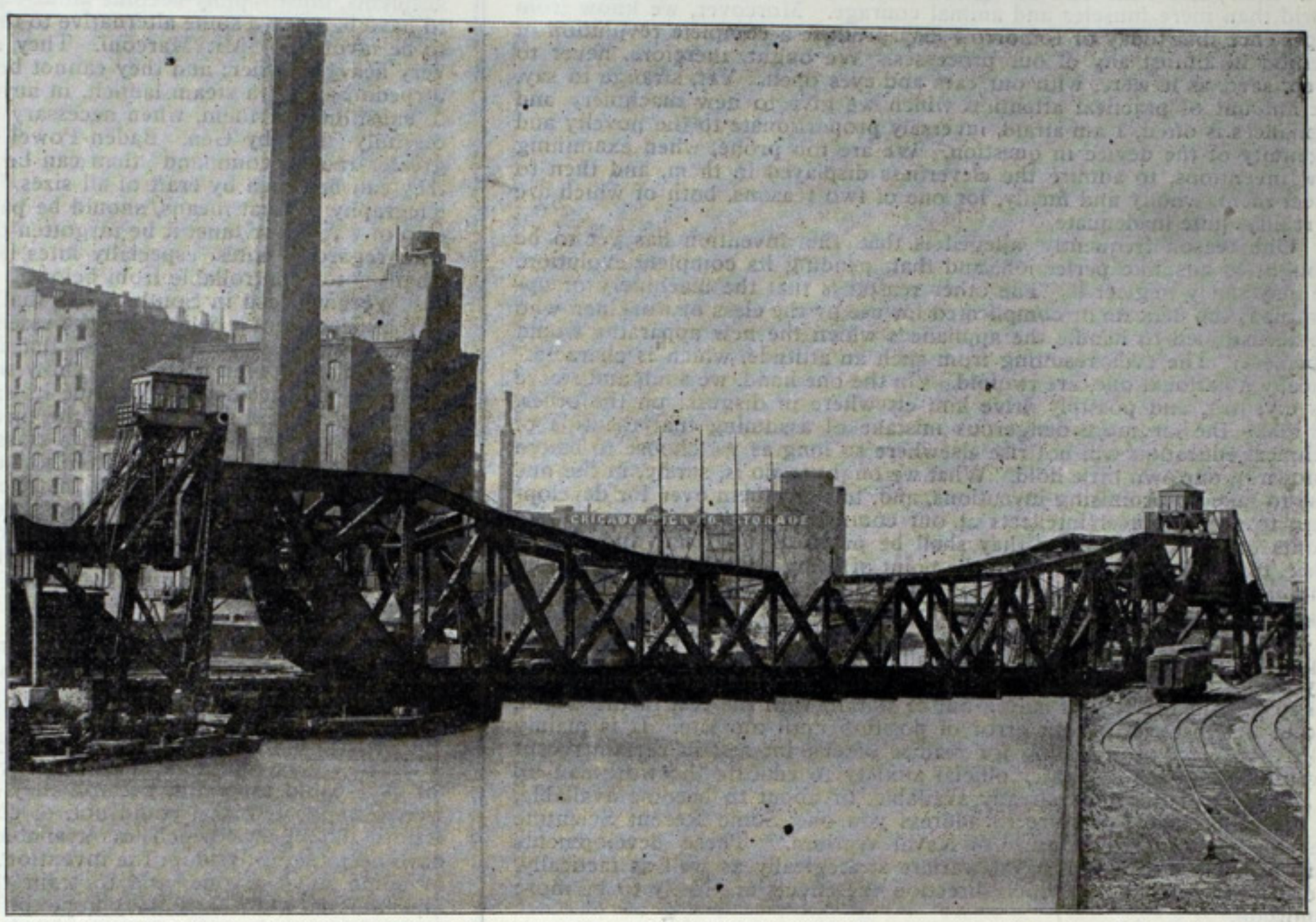
SCHERZER ROLLING LIFT BRIDGE AT GRAND CENTRAL STATION, CHICAGO—View after the removal of Swing Bridge.

Safety—The long swing protection required for a swing bridge is always an obstruction and danger to navigation. It is especially obstructive and dangerous in curved channels and on tide waters or rivers with a strong or changing current. With the rolling lift bridge there is no center-pier or protection in the path of navigation and the clear unobstructed channel may be any width desired. Vessels frequently run into swing bridges and their pier protections because they occupy and obstruct the middle of the navigable channel. These accidents frequently cause expensive damages to both the swing bridges and the vessels. Such accidents are eliminated with the rolling lift bridge. No accidents have occurred from this cause where rolling lift bridges are used. The rolling lift bridge in itself, when open, forms a perfect guard, gate and signal, and effectually blocks the roadway, thus absolutely preventing the many disastrous accidents so common to swing bridges. This inherent danger of the swing bridge is ever increasing on account of increased traffic and the increased speed of traffic.

Adaptability—As the swing bridge moves horizontally, it moves over adjacent land or water space, and may at some time interfere with adjacent property rights or adjacent parallel bridges. In contrast to this the rolling lift bridge moves vertically, entirely within the lines of the roadway and will never interfere with adjacent dock space, adjacent parallel bridges or any land or water rights, all of which items may, during the life of a bridge, become of great importance, even in the widest rivers. The wider the roadway of a swing bridge, the more obstructive and dangerous the swing bridge becomes to navigation. This is not the case with the rolling lift bridge, as it can be made any width desired without encroaching upon the navigable channel. A wide bridge of this tye is as unobstructive as a narrow one, as demonstrated by four-track, six-track and eight-track rolling lift bridges in existence. The swing bridge has always been a curious anomaly among modern engineering structures. The swing bridge usually spans two inadequate channels where only one adequate channel is required. With the rolling lift bridge it is no longer necessary to span two channels where only one adequate navigable channel is required. It may be urged that it is a great advantage to separate a navigable channel for vessels into two parts by a strong pier and protection as provided by the swing bridge. If this were true, it would then be desirable to separate navigable rivers and channels by strong piers or partition walls throughout their entire length. With the rolling lift bridge the navigable waterway can be crossed by the shortest possible movable span and provide an ample unobstructed clear channel for the passage of vessels. This shortens the length of movable bridge required. The rolling lift bridge may be erected in the upright position. Its erection is rapid and economical and need never obstruct, divert or delay either railroad, highway or vessel traffic. A dredged navigable channel need never be widened to accommodate rolling lift bridges. The roadway of a rolling lift bridge can be placed closer to the water than is possible with the swing bridge, because all the movable parts of the former except the floor can be and are frequently placed entirely above the roadway, while the turntable of a swing bridge must necessarily be below the roadway. The rolling lift bridge can be divided or constructed in any number of parallel bridges, which may be operated either jointly or separately as desired; this, as will be evident, is entirely impossible with the swing bridge. If it is desired to widen a swing bridge, the existing swing bridge with its supporting pier and pier protection and abutments must be discarded and removed. Also, the adjacent fixed spans must be removed and a larger and more obstructive center pier and protection pier must be constructed. New abutments and shorter adjacent fixed spans must be built. This great waste is entirely unnecessary with a rolling lift bridge; if it is desired to widen such a bridge for increased traffic or future demands of traffic, any number of new bridges can be added parallel to the existing bridge without in any manner interfering with the latter structure, with the traffic across the bridge or with the traffic in the channel.

Reliability—Vessel, railroad and highway traffic are all delayed as vessels must move slowly and with difficulty through the side openings of a swing bridge because of the long obstructive pier protection. Vessels can move rapidly, safely and easily through the openings of a rolling lift bridge, as it provides an adequate unobstructed opening in the center of the navigable channel without any long pier protection obstruction. As a consequence of the rapid movement of vessels through the bridge, highway and railroad traffice across the bridge are greatly facilitated. Time is also saved because a rolling lift bridge is opened and closed much more rapidly than any swing bridge. It is usually opened or closed within half the time required for a swing bridge of equal capacity. Time is also saved because tugs and small craft require only a partial opening of a rolling lift bridge. This is especially important when the bridge crosses the channel at a slight elevation above water, as a large proportion of the movements required of a low-level bridge are for permitting the passage of tugs and small craft. The swing bridge cannot move away from a vessel as rapidly as a rolling lift bridge. It is consequently in danger of being pushed off from the center pier, and such accidents have happened. The rolling lift bridge not only moves away from a vessel more rapidly but also moves vertically and away from the navigable channel. When a swing bridge is disabled, land or water traffic or both are blocked. The rolling lift bridge can consist of two or more parallel bridges, side by side, some of which will always be available and prevent the blocking of either railroad, highway or water traffic. The center pier and protection pier of a swing bridge cause the formation of sediment in navigable channels. They occupy a considerable area in such channels and require the maintenance and dredging of a larger area than is required when rolling lift bridges are used.

The swing bridge is supported by a large number of rollers, unequally loaded, frequently wearing out the tracks, breaking and constantly requiring attention, repairs and replacement, thus causing delays. On the other hand, the large rolling segment of the rolling lift bridge is a part of the movable bridge truss. It moves virtually without friction upon a straight, smooth and level track, and a century of maximum use will not wear out either the segment or the track. The rolling segment is the most perfect and most simple known mechanical device to reduce friction in the movement of large masses. The swing bridge requires end lifts, rail lifts and latches. These are not required with the rolling lift bridge. The rolling lift bridge is a very rigid structure, whereas the swing bridge must necessarily be flexible and is statically indefinite. In a double-leaf rolling lift bridge, such as shown in the illustrations herewith, when the bridge is closed for railroad traffic, the two leaves automatically interlock at the center without interlocking machinery. It is more rigid than a fixed truss of equal length of span because the counterweight reduces vibration. A single-leaf rolling lift bridge when closed forms a fixed truss with the advantage of the counterweight to produce rigidity.



SCHERZER ROLLING LIFT BRIDGE AT GRAND CENTRAL STATION, CHICAGO—View showing Bridge closed for Railroad Traffic.

Artistic outlines—It is impossible to build a swing bridge in the form of an arch, and in fact the outlines of a swing bridge have never been considered artistic. The possibilities of artistic outlines with the rolling lift bridge, however, are virtually unlimited. For instance, where artistic outlines are desired in a bridge across a wide river and the fixed connecting spans are arched, the draw-span may also be arched, harmonizing with these spans. The rolling lift bridge can have the outlines and even the ornamentation of the Alexander III bridge at Paris and in addition thereto be made movable to accommodate navigation. It is evident that this is impossible with the swing bridge.

Economy—The first cost of construction of a rolling lift bridge is more economical than the first cost of construction of a swing bridge of equal capacity. The cost of operation and maintenance of a rolling lift bridge is less than the cost of operation and maintenance of a swing bridge. The great waste incident to discarding a swing bridge when an increased width of roadway is required is saved by using a rolling lift bridge in the first instance. The substructure of a rolling lift bridge requires less material and costs less than the substructure of a swing bridge with its necessary protection pier. The first cost and the large cost of maintenance of the protection pier of a swing bridge is entirely saved with a rolling lift bridge.

The strongest evidence of the superiority of the rolling lift bridge over the swing bridge is the fact that the most able and progressive railroad and municipal engineers appreciate the many advantages of this type of bridge and have been and are discarding and replacing their swing bridges with rolling lift bridges. Vessel interests have for many years favored the bascule, or rolling lift bridge, and have universally condemned the center-pier swing bridge as shown by their repeated protests. These protests have already resulted in the removal of center-pier swing bridges at Chicago, Milwaukee, Cleveland, Buffalo, New York (Harlem river and Newtown creek), Boston, Philadelphia and other cities. The attitude of the vessel interests has been firmly and forcibly expressed by the passage of resolutions at the annual meetings this year of the Lake Carriers' Association, the Ship Masters' Association and the Masters and Pilots' Association, each condemning any further construction of center-pier swing bridges in navigable channels, as the science of bridge building has advanced so far that artificial obstructions in navigable channels are no longer necessary.

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La Savoie, new French line steamship, broke all previous records of her westward passages last week. The time from Havre to the Hook was 6 days and 4 hours, which is 6 hours and 50 minutes better than her previous time. The biggest day's run was 559 miles.

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The William R. Trigg Co., Richmond, Va., has notified the navy department that the torpedo destroyer Dale is ready for her trial trip. The destroyer is expected to make 26 knots per hour in free route.

# RECENT SCIENTIFIC DEVELOPMENTS AND THE FUTURE OF NAVAL WARFARE.*

BY WILLIAM LAIRD CLOWES.

At a time like the present, which is one of extremely rapid scientific progress, it is especially incumbent upon us not to neglect, even for a single unnecessary day, any device which may possibly enable us, either in peace or in war, to defeat our rivals by honorable means. Scientific discovery tends ever more and more to obliterate the significance of those physical and moral differences which anciently rendered one race superior to another; and brain and thought are already more potent factors in the world than mere muscles and animal courage. Moreover, we know from experience that today or tomorrow may produce a complete revolution of method in almost any of our processes. We ought, therefore, never to sleep, save, as it were, with our ears and eyes open. Yet, strange to say, the amount of practical attention which we give to new machinery and appliances is often, I am afraid, inversely proportionate to the novelty and ingenuity of the device in question. We are too prone, when examining new inventions, to admire the cleverness displayed in them, and then to reject them, wholly and finally, for one of two reasons, both of which are in reality quite inadequate.

One reason frequently alleged is that the invention has yet to be brought to absolute perfection, and that, pending its complete evolution, we may safely neglect it. The other reason is that the machinery or apparatus is too delicate or complicated for use by the class of workmen who are accustomed to handle the appliances which the new apparatus would supersede. The evils resulting from such an attitude, which is characteristically a national one, are twofold. On the one hand, we snub and starve the inventor, and possibly drive him elsewhere in disgust; on the other. we make the far more dangerous mistake of assuming that the tide of technical education will not rise elsewhere so long as we choose to batten it down in our own little hold. What we ought to do is, surely, in the one case to take up promising inventions, and, turning them over for development to the brightest intellects at our command, to enjoy the exclusive profits of them as soon as they shall be practically perfect; and, in the other, to educate our men up to the point of being able to use delicate and complicated appliances, instead of rejecting the appliances because our existing men are incapable of handling them. It is absurd for us to say, as in practice we do, "Don't offer us any unfamiliar novelty that isn't approximately perfected; and, above all, don't offer us any perfected novelty that isn't approximately familiar." While we continue to follow that policy we run the risk of falling out of station with the rest of the world, and of not discovering our error of position until too late. It is mainly with the object of appealing for readier official interest in certain recent inventions and for a greater official anxiety to educate the workman up to the level of the tools already available, or about to become available, to his hand, that I venture to address you on "Some Recent Scientific Developments and the Future of Naval Warfare." These developments must inevitably influence naval warfare strategically as well as tactically, and it is hard to say in which direction the effects are likely to be more important.

Within the compass of little more than a lifetime the practice of naval strategy has already been revolutionized by the introduction of steam and the electric telegraph. The principle of strategy, however, has suffered no change. It is very simple, and it may still, as in the days of Nelson, be thus formulated: To have at the right spot, and at the right moment, a fighting force superior in personnel, as well as in material, to the force of the enemy at the same time and place. But the practice is still changing rapidly, and, under the influences of recent invention, it must change still more. We have not yet realized to the full the strategical value of speed as a factor in the successful carrying out of the fundamental object of strategy. Speed, in the present, is all that, and more than, the weather gauge was in the past; and, if we neglect it, we shall cripple the hands of our admirals, no matter how many ships and men we may place at their disposal. It is the soul of all effective combination for offence; and I am not sure that it is not equally valuable as a means of defence against certain weapons which at present cannot easily be otherwise avoided—to-wit, submarines. The submarine, of which more anon, is essentially a slow craft, whether she travel on the surface or below it. A large ship can have no more secure protection against the submarine than the fact that she is in very rapid motion. A submarine must come to the surface to look about her; and if her big enemy be seen to be changing position rapidly, the submarine can gather little information that is likely to be of use to her. And here I should like to say that our own preparations for attacking submarines with spar torpedoes, fitted to torpedo boats or destroyers, are exciting the ridicule of those foreign nations, which, from experience with them, know what submarines are like. We claim that our specially rigged spar torpedo can reach a submarine at a depth of 10 ft. below the surface. Com'dr W. W. Kimball, U. S. N., says, justly: "Why a submarine should run at 10 ft. instead of 30 ft. or 40 ft. does not appear; nor does it appear how the destroyer could, when the submarine showed for a few seconds, head for her, and strike her with the spar torpedo before she attained a safe depth. While the battleship, protected by the destroyer, is the proper quarry of the submarine, there seems to be no law against sinking the destroyer in passing, if her presence were inconvenient." The truth seems to be that, if the submarine can be reached at all by the spar torpedo, she can—at least in the vast majority of cases—be reached much more expeditiously and certainly by means of the gun; though it may be desirable to mount guns in a special manner in order to deal with her.

The offensive usefulness of speed has, I believe, been doubled or trebled by recent improvements in wireless telegraphy. It looks as if every ship, large or small, in future naval warfare might be, as it were, the mobile terminus of an unlimited number of ærial cables communicating not only with the base on shore, but also with all friendly ships within a radius of several hundreds of miles. It is true that last year, when wireless telegraphy was employed by one side during the naval maneuvers, the system broke down by the reason that the rival commander was able to tap the messages, and did not use wireless telegraphy himself. But the breakdown on that occasion was due entirely to the manner in which wireless telegraphy was misused. The defeated commander might either have employed a code for the sending of his message, or have used some variety of wireless telegraphy which was not tapable. It is merely a question, on the one hand, of a special cypher, or, on the other, of special discharge terminals, coherers, and relays. The possible variety is infinite; and it is hardly conceivable that in war time the cypher of one side should be known to the other, or that both sides should use exactly similar instruments, similarly, "attuned." Given a good and untapable system of wireless telegraphy, utilizable over long distances at sea, naval strategy, barring accidents, must rapidly become almost an exact science. But it is desirable to have in reserve some alternative to the lofty spars which at present seem to be favored by Mr. Marconi. They cannot be carried by any vessel in very heavy weather; and they cannot be carried by a small craft, such as a torpedo boat or a steam launch, in any weather. It ought to be possible to substitute for them, when necessary, kites, such as, I believe, were successfully used by Gen. Baden-Powell at Mafeking. These have much greater radial "command" than can be given to spars on board ship, and they can be flown by craft of all sizes. Electrical kite-flying, and wireless telegraphy by that means, should be part of the ordinary routine of every ship of war. Nor must it be forgotten that there is yet much to be learned with regard to kites, especially kites large enough to carry with them a small motor controllable from below.

We have seen in South Africa that, assuming good intelligence to be at the disposal of a beligerent, the essence of effective practical strategy is extreme mobility—extreme speed, that is. I rejoice, therefore, though it is perhaps hardly even a straw to show which way the wind blows, that the admiralty has decided to continue its experiments with turbine propellers in destroyers, and also to apply the turbine principle of propulsion to one comparatively large vessel, a third-class cruiser. I trust, too, that Whitehall has already devoted its attention to Mr. J. T. Marshall's new valve gear, for there can be no doubt that we must witness, within the next few years, an enormous increase in the speed of large fighting ships; and, then, woe betide the power which lags behind its rivals in the matter of rapid mobility. It will see itself condemned to forego strategy altogether in its naval combinations—in other words, it will find itself confined to the local defensive.

As regards tactical factors, what I have said as to our habitual attitude to new inventions applies more perhaps to them than to strategical factors. Take, for example, the question of range-finding in action at sea. I was once in one of his majesty's ships in which a set of range-finding instruments was fitted experimentally. The appliances were rejected without undergoing a really fair trial. They were tried superficially by people who knew next to nothing about them; and they were condemned, not, so far as I could ascertain, because they were ineffective, but because they were complicated, and could not, of course, be worked easily by the untrained intelligence which was available to handle them. Surely it would have been better to adopt the invention, which had been well tried abroad, or some superior one, and to train the necessary intelligence. In the meantime, how does our navy hope to find the range in action? It depends mainly upon being able to note the drop of tentative shots. Where two single ships are engaged, this method, though slow and unscientific, may possibly work; but when whole fleets are engaged, how can any human eye feel certain whence comes the particular shot the drop of which is noted? At Santiago it was found impossible to form any correct conclusions in that way. Now there are many excellent and almost perfect range-finders. I will mention only the Barr and Stroud, which is said to be responsible for the recent excellent shooting of the Terrible, and the Zeiss stereoscopic, each of which reduces the possibility of error to a minimum, though there are others almost equally good. For years we have been flirting with such inventions; for years we have refrained from taking them to our arms, because of our fear that we do not sufficiently understand them. They ought to have been long ago in all our fighting ships. By this time we should then have learned to understand them. Other nations have adopted them. What will happen if we fall into a conflict with one of those other nations?

Naval gunnery will also be greatly improved so soon as two or three comparatively small problems which are now awaiting solution shall have been solved. Their solution ought not to be long delayed, if only the right kind of intellects can be persuaded to turn their attention to them. The great want of the day is, of course, an arrangement whereby it shall be possible to fire a projectile through moderately thick modern armor, and to burst it immediately in rear. Another great want is some new method of igniting smokeless powders. These powders, especially when fired in relatively small guns, are, as their name implies, practically smokeless. But at present the most convenient method of igniting them is found to be through the medium of an ignition charge of black powder of the old smoky kind. In small weapons the ignition charge, and the quantity of smoke produced by it, are insignificant; but in the case of heavy guns the ignition charge alone comprises about as much black powder as formerly would have sufficed for a couple of full charges for the old 64-pounder muzzle-loader; and, the volume of smoke thus produced being very considerable, the advantages of employing smokeless powder are to a large extent neutralized.

A very noteworthy development of recent science, and one that cannot fail to greatly influence the tactics of future naval warfare, is the modern submarine. I am not a submarine enthusiast; but it is impossible not to recognize that the extension of the open field of naval operations from a space of two dimensions only to one of three is too significant to be lightly regarded. The best existing submarine is very slow, very blind, of limited radius of action, and very liable to accident; but it is vain utterly to deny the value—especially the moral value—of a craft which, without leaving your immediate vicinity, can move altogether out of your sphere of activity, and still, perhaps, deal you a fatal injury. It seems to me that the submarine, even if it be carried no further than at present, means the doom of the old-fashioned blockade. But I am sure that the submarine will be carried very much further than at present, and that already we may see traced out before us the lines along which it is destined to develop. The weakest points of the best existing submarines are: That they cannot see clearly unless they come to the surface to do so; that they cannot be sure of maintaining a given course under water, even by utilizing the Obry

*Paper read at annual meeting of Institution of Naval Architects.

apparatus; and that the lives of the crews within them are exposed, especially in war time, to extreme risks.

During the past three or four years numerous ingenious inventors have turned their attention to this subject with a view to producing a vessel which shall be capable of moving at considerable speed beneath the surface of the water; which shall not need a human crew; which shall not want to see whither it is bound; which shall be controllable at every moment of its course; which shall not expose those who work it to extraordinary risks; and which shall be manageable from a distance without the intervention of wires or other visible connections. It is sought, in a word, to combine the useful features of the existing submarine, of the automobile torpedo, of the electrically countermining launch, and of the Brennan torpedo; dispensing, at the same time, with material ties between the operator and the weapon, and securing a range, which though less than that of the submarine, shall be far greater than that of the countermining launch, the Whitehead, or the Brennan. Some scores of patents bearing upon these projects have been issued to Messrs. Axel Orling and James Tarbotton Armstrong, Arthur A. Govan, Cecil Varicas and Bradley A. Fiske, the last named being the well-known American naval officer who is famous in connection with more than one range-finder, and with other inventions designed to influence the future of naval warfare. These gentlemen utilize various forms of energy in various ways; and it is impossible here to go into details of their inventions. It must suffice to say that, although no perfect form of vessel controllable by wireless currents—a form to which I have ventured to give the generic name of "Actinaut"—has yet been produced, more than enough has been accomplished to demonstrate that what it is sought to effect can be effected and will be effected in the near future. Indeed, if it were possible to induce these rival inventors to combine and co-operate, and if it were possible to place at their disposal the knowledge and experience of half a dozen men such as Lord Kelvin, Sir Hiram Maxim, Mr. Brennan and Mr. Marconi, I verily believe that you might have the perfected engine before you on this day next year. When that perfected engine is produced it cannot fail to work something like a revolution in naval warfare.

All these considerations bring me back again to one of the points from which I started. Our best available tools are rapidly getting beyond the effective control of our best available men, and the real lesson of the situation undoubtedly is that if we would properly utilize all the resources which science has placed, and will presently place, at our disposal for the prosecution of naval warfare, we must greatly improve the scientific standard of the personnel. It is significant that Lord Charles Beresford, without committing himself to any expression of opinion as to the merits of certain types of water-tube boilers, has hinted his belief that many of the breakdowns of those boilers may possibly be attributable, not so much to the defects inherent in the boilers, as to the incompetency of the working staff, an incompetency due to lack of training and experience, and perhaps also to short-handedness. The present board of admiralty is admittedly anxious to make the naval service all that it should be; nor does it resent friendly criticism. I would therefore ask their lordships to reflect whether the present methods of dealing with the scientific problems and daily work of the royal navy can possibly produce satisfactory results.

There are two categories of scientific officers in the service—the engineers proper, and the specialist executive officers. The engineers are men with a relatively long, broad and deep scientific and technical training. They are an expensive class, and at present the navy has confessedly failed to attract and retain the best specimens of the class. The specialist executive officers are, so Mr. C. M. Johnson, R. N., has irreverently said, "men who dabble in electricity, fiddle about with files and hammers, set up amateur lathes in their cabins and imagine that they are making engineers of themselves." I do not associate myself with this description of a class of officers who, no matter what else may be said of them, are remarkably keen, and do their work astonishingly well, so far as the conditions permit. But the conditions do not permit much. A torpedo lieutenant generally gets about seventeen months of technical training in the course of his career. This is, naturally, not enough to make a well-equipped electrical engineer of even the most brilliant of men, still less is it enough to make of him a mechanical and hydraulic engineer as well.

Nevertheless, with a view, I suppose, to economizing expenses and to restricting the total number of commissioned officers carried, the admiralty has entrusted a great many purely engineering duties to specialist executives, and in addition, has turned over the entire control of the engineering department in small ships to a warrant officer—an artificer engineer. Not only is this officer of necessity a man of limited education and experience, but also he is now a man less experienced than his fellows formerly were; for a lowering of the standard of qualification has recently been sanctioned. In the meantime, to assist the specialist executives, a class of ratings known as electrical fitters has been lately called into being. This is composed of men who have very little electrical knowledge at all. And so we see that whereas at one time all the engineering business of the ship was in the hands of properly qualified engineer officers, much of it is now entrusted to specialist executives, much to warrant officers, and some to people admittedly possessed of hardly any scientific training at all.

While, in short, the material has been improving yearly, the personnel has been assuming more and more the character of a penny-wise-pound-foolish makeshift. This state of affairs must, I think, be remedied if we would profit fully by recent scientific developments. The brightest scientific intelligences ought to be attracted to the navy, and to be retained there when once they have been engaged; and I see no reason why they should not be. We are now paying 5s. a day in South Africa to soldiers—men whose necessary qualifications are little higher than those of unskilled laborers. It can hardly be doubted that a first-rate naval engineer officer, even if you have to pay him a thousand a year, is a much cheaper article than an imperial yeoman at £91 5s. Moreover, while you can pick up the latter at any time, you can secure the former only if you engage and train him at a time when, as at present, you are sorely tempted to do without him, and to entrust his work to an amateur.

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The B. F. Sturtevant Co., Boston, Mass., has issued a very pretty little booklet upon the subject "Mechanical Draft—What It Is and What It Does." Nearly all the literature which comes from the Sturtevant company is good and this little booklet is particularly dainty.

## SHIP YARD NOTES.

The Oakland Inquirer makes the following report of ship construction at Oakland, Cal.: Among the new contracts secured at Dickie's ship yard is one for a steam schooner of about the same size as the Newburg, 140 ft. in length, for Pollard & Dodge, and a second one for a three-masted schooner, 160 ft. long, for Sudden & Christensen. An 82-ft. tug for the Ship Owners & Masters' Association and a 70-ft. tender for the Alaskan Packers' Association are on the stocks. Hay & Wright have begun work upon a dredger of the following dimensions: Length, 134 ft.; beam, 50 ft., and depth 12 ft. At Boole's ship yard the keel for the new Santa Fe tug has been laid and work on the new barkentine Makaweli insures the launching of that vessel during the present month.

A new wooden steamer, the Hermosa, was successfully launched from the Banning Co.'s yards on Terminal Island, San Pedro, Cal., recently. The Hermosa was built by the Wilmington Transportation Co. for the passenger and freight trade between San Pedro and Catalina island. She will take the place of the old Hermosa, which is being dismantled, and will be the largest steamer in that service. Her dimensions are: Length over all, 150 ft.; beam, 28 ft.; depth, 14½ ft. The passenger traffic to Catalina island is increasing rapidly and the Wilmington Transportation Co. has now four boats on the route.

Mr. M. B. McDonald, the Noank ship builder, has purchased the Hill ship yard in Mystic, Conn., and will establish a modern plant for the building of wooden craft. His first contract will probably be a three-masted schooner for Capt. John Emmons, now in the schooner John Booth. The Hill ship yard is one of the trio of old-time ship building sites of Mystic that are famous for turning out clipper ships. At the Hill yard the Andrew Jackson, which acquired international fame, was launched.

The new revenue cutter Mohawk was successfully launched from the ship yard of the William R. Trigg Co., Richmond, Va., recently. She is 205 ft. long, 32 ft. beam and 17 ft. deep. Her engine will have cylinders of 25, 37½ and 56½ in. diameter by 30 in. stroke. Steam will be supplied by four Scotch boilers. The Mohawk will be assigned first of all to the West Indies, but her eventual station is the Pacific.

A 3,000-ton barge, the Cienfuegos, building at the Kelley, Spear Co.'s yard, Bath, Me., will go overboard Tuesday, April 8. The Santiago, a sister barge, will not be ready for launching before the last of May. Work has been started at this yard on a four-masted schooner for Charles S. Hirsch & Co. of New York. Her dimensions will be: Length, 160 ft.; breadth, 36 ft.; depth, 13 ft.

The Atlantic Works, East Boston, Mass., is building a steamer to be known as the City of Haverhill for Burtison & Peterson. The steamer will be 135 ft. long, 24 ft. beam, and will have a draught of 8 ft. The steamer will have a compound engine and two Almy water-tube boilers.

It is understood that the old Bay line of Baltimore, the Mallory Steamship line of New York and the Standard Oil Co. are in the market for new vessels and that several Atlantic coast ship builders are now estimating on vessels for these companies.

The Tacoma Ship Building Co., Tacoma, Wash., has a contract for a barkentine to be built for Sudden & Christensen of San Francisco. The vessel will be 212 ft. in length, 41 ft. beam and 15½ ft. deep. Her cost is to be $60,000.

T. C. Reed of Ballard, Wash., is building five new vessels for the Globe Transportation Co. of Seattle, Wash.

## PACIFIC COAST VESSELS BUILT DURING 1901.

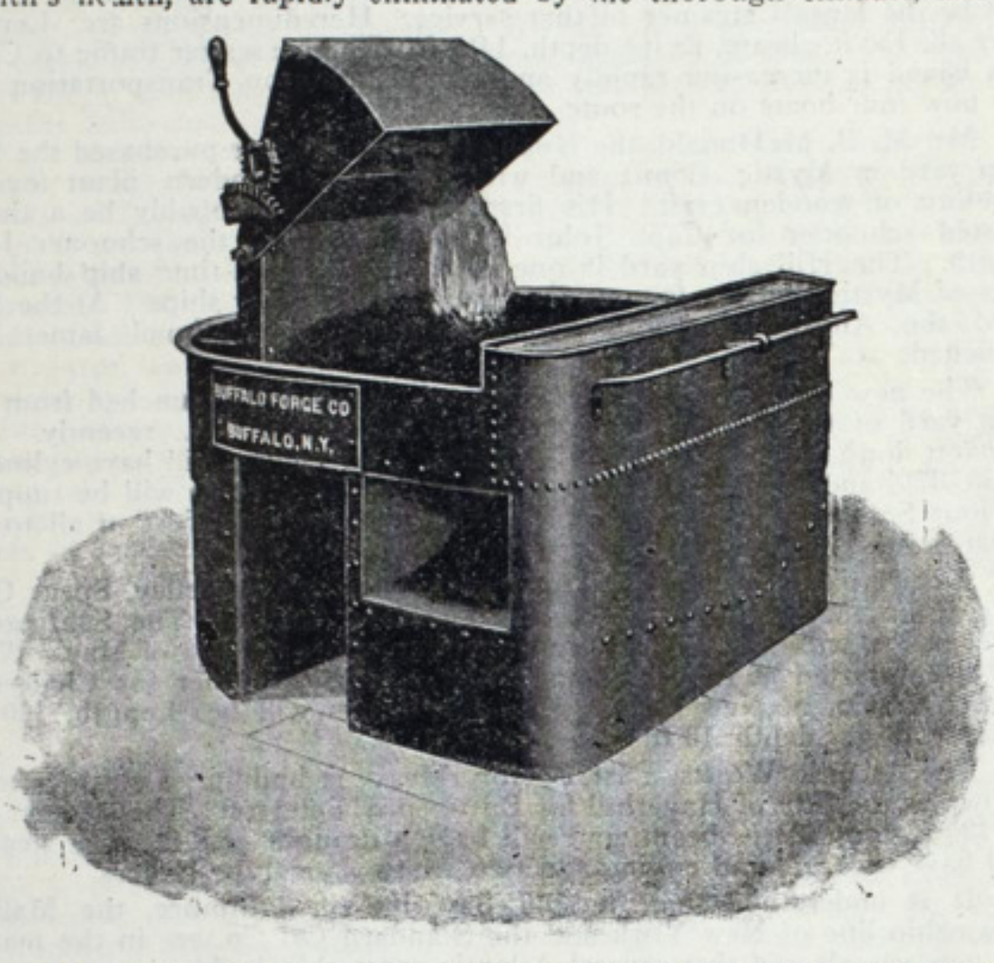
The annual report of the San Francisco chamber of commerce contains a tabulated list of vessels constructed on the Pacific coast and documented during 1901. This, of course, does not include vessels begun during 1901 and which have not yet been completed. It will be noted that with few exceptions they are vessels of less than 100 tons register. Only four of them are over 1,000 tons. Following is the list:

| Rig. | Name. | Builder. | Where Built. | Gross Tonnage. | Net Tonnage. |
|---|---|---|---|---|---|
| Stmr. | Jersey | Jarvis & Son | Stockton | 41 | 39 |
| Stmr. | Hanalei | Alexander Hay | Alameda | 666 | 502 |
| Stmr. | Acme | John W. Dickie | Alameda | 416 | 269 |
| Sloop | Geo. F. Haller | Risdon Iron Works. | Alameda | 139 | 81 |
| Stmr. | Sea Prince | Fulton Iron Works. | San Francisco | 58 | 27 |
| Stmr. | Tyonie | R. W. Schultz | San Francisco | 59 | 36 |
| Stmr. | Mohawk | J. R. Cresty | San Francisco | 18 | 6 |
| Stmr. | Ugashik | G. W. Kneass | San Francisco | 21 | 8 |
| Stmr. | Togiak | G. W. Kneass | San Francisco | 21 | 8 |
| Schr. | Katata | John Twigg & Sons. | San Francisco | 12 | 9 |
| Stmr. | Uyak | J. C. Beetle | Alameda | 22 | 12 |
| Stmr. | Oneida | James Madison | San Francisco | 21 | 7 |
| Schr. | Crockett | E. Munder | San Francisco | 62 | 56 |
| Stmr. | Newtown | Matthew Turner | Benicia | 77 | 64 |
| Schr. | Solano | Matthew Turner | Benicia | 728 | 692 |
| Stmr. | Chilcat | Fulton Iron Works. | San Francisco | 172 | 98 |
| Stmr. | Hilda | United Eng. Works. | San Francisco | 18 | 6 |
| Stmr. | Quinnat | United Eng. Works. | San Francisco | 31 | 14 |
| Stmr. | Alitak | United Eng. Works. | Alameda | 115 | 73 |
| Stmr. | Tamalpais | Union Iron Works. | San Francisco | 1,554 | 937 |
| Schr. | Mindoro | Hay & Wright | Alameda | 679 | 642 |
| Stmr. | Kayak | United Eng. Works. | Alameda | 679 | 642 |
| Schr. | Helen | John A. Lockhart | Sausalito | 15 | 9 |
| Schr. | Kona | Alexander Hay | Alameda | 679 | 642 |
| Brknt. | Lahaina | W. A. Boole & Son. | Oakland | 1,067 | 994 |
| Schr. | W. H. Marston. | W. F. Stone | San Francisco | 1,169 | 1,110 |
| Schr. | Geo. W. McNear. | H. Anderson | San Francisco | 99 | 88 |
| Stmr. | Alma | F. C. Laurentzen | Rio Vista | 11 | 10 |
| Schr. | H. Eppinger | E. Munder | San Francisco | 96 | 89 |
| Stmr. | Warrior | William Muller | Wilmington | 122 | 83 |
| Stmr. | Gualala | John W. Dickie | Alameda | 225 | 158 |
| Stmr. | Gov. M. B. M. | E. J. Stone | San Francisco | 14 | 10 |
| Stmr. | Valletta | W. J. Delonoy | Benicia | 419 | 368 |
| Stmr. | Fox | R. W. Schultz | San Francisco | 20 | 13 |
| Schr. | Samar | Alexander Hay | Alameda | 710 | 673 |
| Brknt. | Amaranth | Matthew Turner | Benicia | 1,109 | 1,062 |
| Stmr. | Elaine | W. F. Stone | San Francisco | 14 | 9 |
| Stmr. | Martha Jane | J. E. Hicks | Sacramento | 50 | 45 |
| Sloop | Union | P. Swanson | Belvedere | 13 | 9 |
| Schr. | Theo. Roosevelt. | Henry Schroeder | San Francisco | 62 | 51 |
| Schr. | Shell | Oliver Ortley | Alviso | 16 | 13 |

## IMPROVED DOWN-DRAFT FORGE.

In reviewing the progress that has characterized American manufacturers of late years, it might be supposed that the blacksmith or forge shop has been slow to take up new ideas. This has not been the case. On the contrary, there was room for improvement in this particular line and the evidences of advancement are to be seen in forge shop equipment everywhere. The Buffalo Forge Co.'s system of down-draft forges has had much to do with this progress.

In the down-draft method of forge construction the smoke and gases are immediately and completely withdrawn by means of down-draft suction through an adjustable hood and underground tile piping. Indeed there is no escape of gases, fumes or smoke from the largest fire. The cast iron hoods are adjustable to different positions, according to conditions at the fire. It is claimed that these forges are practically indestructible. Cases are recalled where Buffalo down-draft forges, taken from burned buildings have been re-installed without repairs of any kind. Fumes of hard coal, coke and furnace fires, which are a menace to the smith's health, are rapidly eliminated by the thorough exhaust, and the




forge shop atmosphere is often as pure as a well-ventilated machine shop. They have ample blast. Space and light about the forge is not obstructed by telescopic hoods, which are subject to frequent renewals.

The illustration shows the latest design of the Buffalo down-draft forge. It is strikingly neat and compact yet not filled to excess. This forge stands 27 in. to the top of fire pan, which is 24½x47½ in. It has a water tank 6 by 47 in. and 10 in. depth and a coal box 10 by 14 in. and 47½ in. long. It is also furnished with tool rack, a blast gate, an improved anti-clinker dumping tuyere, and Buffalo patented down-draft smoke exhaust hood. This forge, with the exception of the down-draft hood and anti-clinker dumping tuyere, which are of heavy cast iron, is constructed entirely of heavy gauge steel plate, and is thoroughly braced. It is best adapted to medium work but is also well suited to light and heavy forging.

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Describing the handling of destroyers by Lord Charles Beresford, while in command of the Mediterranean fleets, the London Sketch tells us that the resourceful admiral took his battle fleet into action in line ahead. At a given signal the battleships turned slightly inward, and round the bow of each rushed a destroyer, which bore down at full speed upon the enemy, torpedoed him and then turned back to the friendly shelter of the battleship again. So skilfully was the maneuver executed that the destroyers had done their work and returned in safety before the surprised enemy could get guns to bear upon them. The battleship and destroyer, therefore, like the lion and the jackal, hunt in couples.

## SHIP BUILDING IN NEW ENGLAND.

A review of the ship building operations of the year 1901 in New England and the near-by maritime provinces of Canada shows a total tonnage for the states and the provinces of 95,230, of which 80,260 tons were built in New England and 14,970 tons in New Brunswick, Nova Scotia and Prince Edward island. The vessels are, of course, nearly all of wood. From Maine yards were launched two ships, seven barges, forty-one schooners, forty-one sloops, and fifteen steamers, aggregating 106 vessels with a total net tonnage of 47,146. This shows a decline in tonnage from the previous year, when 56,403 tons were launched in Maine, but many large vessels were still on the stocks, although nearly completed, at the close of 1901, most of the work on which should be credited to that year. Massachusetts and Connecticut enjoyed something of a revival in the industry last year. In 1900 Massachusetts built only 3,068 tons, but in 1901 the output increased to 10,593 tons, comprising three lighters, seven barges, thirty-six schooners, nineteen sloops and twenty steamers—eighty-five vessels. In 1900 Connecticut launched only 8,012 tons, but in 1901 her yards turned out 22,495 tons. Rhode Island built only one small steamer last year. The near-by maritime provinces of Canada made a good showing in 1901. New Brunswick built twenty vessels, aggregating 1,608 tons; Nova Scotia built 107 of 12,837 tons and Prince Edward island five vessels of 525 tons.

The summary shows that there were launched from New England and provincial yards last year two ships, thirty-one barkes, three lighters, three barkentines, 197 schooners, sixty-three sloops, ten yachts, seven floats and forty-six steamers, a total of 362 vessels, aggregating 95,230 tons, compared with a total in 1900 of 71,814 tons, showing an increase of 23,416

Ship building is now brisk in most ports of New England and the provinces, and, as usual, Maine is far in the lead in the number and size of vessels under construction, except the large steamships for the Pacific trade now being constructed at New London, Conn. Including vessels launched since Jan. 1, Maine's record thus far in 1902 is thirty-five schooners, eight barges, ten steamers and various smaller craft, while throughout New England and the provinces there are now under construction 175 vessels, aggregating about 105,000 tons. In addition to these, all merchantmen or pleasure craft, New England builders have in hand government contracts amounting to about $17,000,000.

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## AT THE FORE RIVER COMPANY'S WORKS.

The final frames are being put into the seven-masted steel schooner at the Fore River ship yard at Quincy, Mass., and it is intended to launch her in the latter part of May. The work of preparing for the construction of her launching ways has begun already. It is probable that the boilers of the United States cruiser Des Moines, also building at the Fore river company's yard at Quincy, will be installed before the vessel is launched. The wooden sheathing of the vessel's hull is two-thirds done and the painting of her upper works has commenced. A considerable addition has just been made to this company's machine shop, for which several large machines are being built on the premises. The company has increased its power plant by installing another large direct-connected generator and a new 5,000-ft. air compressor. The extension of the power house which this additional machinery made necessary is finished and steam has been turned on.

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The council of Montreal has petitioned the dominion government to bonus Canadian ship building on the great lakes. At the present time it is represented that the surplus products of the Canadian west and northwest are diverted towards the ports of the United States simply because of a lack of Canadian vessels on the lakes. The council has also petitioned the government to grant subsidies to railways north of Lake Superior, to do justice to the growing trade of the northwest and to bring the products of that country through eastern Canada.

## FORTIFICATIONS BILL.

In the report accompanying the fortifications bill, recently reported to the house of representatives, the committee says the total appropriations made for fortifications and other means of defense since 1888 amount to $89,454,027. The scheme of sea-coast fortifications, contemplated by the Endicott board, was estimated to cost in the aggregate $99,392,222, of which sum there had been already provided $53,365,750. The items carried in the bill are:

| | |
|---|---|
| Gun and mortar batteries | $2,000,000 |
| Searchlights for defences in important harbors | 150,000 |
| Installation of range and position finder | 325,000 |
| Sites for fortifications | 200,000 |
| Preservation and repair of fortifications | 150,000 |
| Plans for fortifications | 5,000 |
| Tools, etc., for maintaining and operating electric plants | 25,000 |
| Sea walls and embankments | 100,000 |
| Torpedoes for harbor defence | 50,000 |
| School for submarine defence | 16,500 |
| Armament of fortifications | 3,212,755 |
| Proving ground, Sandy Hook, N. J. | 175,800 |
| Watertown arsenal | 27,400 |
| Watervliet arsenal, New York | 25,000 |
| Ordnance and fortification board | 100,000 |
| Isham shell and Tuttle thorite | 50,000 |

Mr. C. P. Worthington, auditor of the Clergue syndicate at Sault Ste. Marie, recently gave out some interesting facts about the allied companies. The payroll for these companies during February reached a total of $120,000, and, in addition, $50,000 was disbursed for wages at the mines and along the line of railway. These companies disburse for material from $500,000 to $750,000 monthly, but February's total amounted to $900,000. Altogether there are about 4,000 men on the payroll.

### ST. MARY'S MINERAL LAND CO.

The New York Commercial gives the following information to a correspondent regarding the St. Mary's Mineral Land Co., which is also of interest to lake readers: "This company is a reorganization of the St. Mary's Canal Mineral Land Co., effected in the spring of 1901. The company received a large grant of land for the building of the first ship-canal at Sault Ste. Marie. There was considerable litigation from time to time, but a clear title was finally secured to all lands claimed. The lands selected by the company included the tracts on which the Tamarack, Wolverine, Baltic, Tri-Mountain, Champion and other copper mines are now being developed. The policy of the management was to sell lands for mines to new companies, taking part cash and part stock in payment, and most of the stock so secured has been turned over to shareholders as stock dividends. On Jan. 1, 1901, the company held 106,822 acres of land in fee simple, much of which is in the copper belt, with mineral rights to 7,321 acres of additional land, the surface of which has been sold for timber or farm lands. Other assets of the company were $17,203 in cash, 50,000 shares of stock in the Champion Copper Co., 25,000 shares in the Mayflower Mining Co., 20,000 shares in the Pacific Mining Co., 842 shares in the Winona Copper Co., 122 shares of Tri-Mountain and eighty shares of Old Colony.

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## Tug For Sale.



## Boat Wanted for Lumber Trade.



## For Sale—Tug Petrel.







## Naphtha Launch Wanted.



## Tugs Wanted.